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CONSOLIDATED CAB DISPLAY (CCD) SYSTEM, PROJECT PLANNING DOCUMENT--ETC(U)

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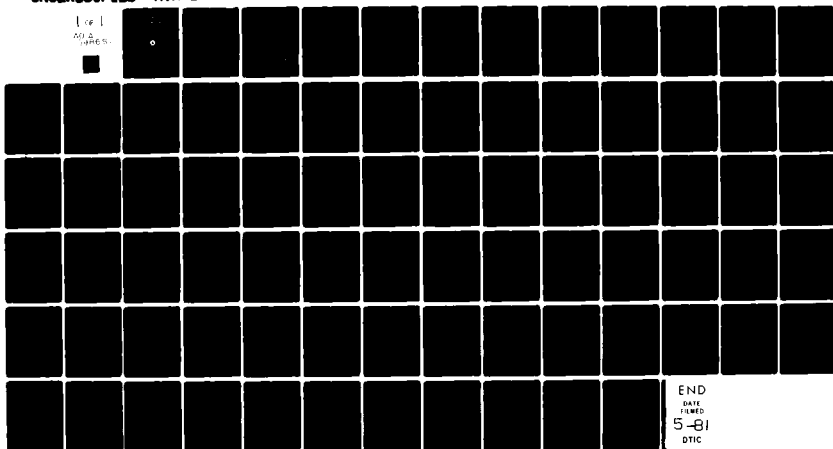
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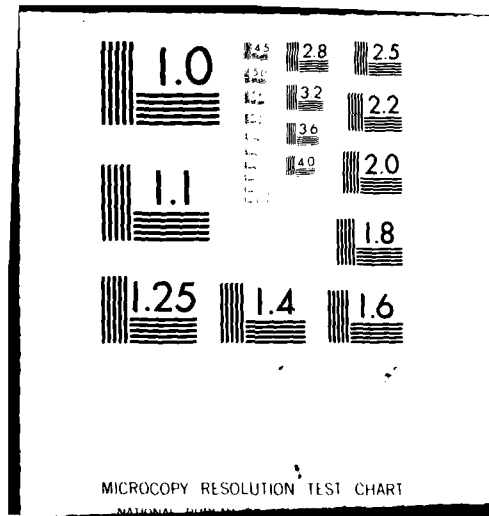
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Report No. FAA-RD-81-6
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CONSOLIDATED CAB DISPLAY SYSTEM PROJECT PLANNING DOCUMENT



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Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
Systems Research & Development Service
Washington, D.C. 20590

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Technical Report Documentation Page

1. Report No. FAA-RD-81-6	2. Government Accession No. D-A098651	3. Recipient's Catalog No.	
4. Title and Subtitle Consolidated Cab Display (CCD) System, Project Planning Document (PPD),		5. Report Date February 1981	
		6. Performing Organization Code ARD-120	
7. Author(s) Al Asch, The MITRE Corporation and L. Wuebker, ARD-120		8. Performing Organization Report No. FAA-RD-81-6	
9. Performing Organization Name and Address U.S. Department of Transportation Federal Aviation Administration Systems Research and Development Service Washington, D. C. 20590		10. Work Unit No. (TRAIS) 51-11	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Systems Research and Development Service Washington, D. C. 20590		11. Contract or Grant No. DTFA01-81-C-10001	
		13. Type of Report and Period Covered Project Planning Document	
14. Sponsoring Agency Code			
15. Supplementary Notes			
16. Abstract This report provides the planning guidance for the development, installation, testing and evaluation for the Consolidated Cab Display (CCD) System. The Federal Aviation Administration (FAA) is acquiring two systems for engineering tests and operational evaluations to determine system reliability and design acceptability to Air Traffic Control Tower (ATCT) and Terminal Radar Control (TRACON) controllers. One system will be installed at the FAA Technical Center for engineering and operational evaluations, and a second one at the Atlanta ATCT/TRACON for operational evaluations. The evaluations will provide the FAA with information for making decisions and developing programs for future automation support to the ATCT/TRACON air traffic control specialists.			
17. Key Words Consolidated Cab Display (CCD) Terminal Branch (ARD-120) Project Planning Document (PPD)		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 68	22. Price

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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH

in	inches	2.5	cm
ft	feet	30	cm
yd	yards	0.9	m
mi	miles	1.6	km

AREA

m ²	square inches	6.5	cm ²
ft ²	square feet	0.09	m ²
yd ²	square yards	0.8	m ²
mi ²	square miles	2.6	km ²
	acres	0.4	ha

MASS (weight)

oz	ounces	28	g
lb	pounds	0.45	kg
	short tons (2000 lb)	0.9	t

VOLUME

tblsp	tablespoons	5	ml
fl oz	fluid ounces	30	ml
c	cups	0.24	l
pt	pints	0.47	l
qt	quarts	0.95	l
gal	gallons	3.8	l
cu ft	cubic feet	0.03	m ³
cu yd	cubic yards	0.76	m ³

TEMPERATURE (exact)

F	Fahrenheit temperature	5/9 (after subtracting 32)	C	Celsius temperature
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Approximate Conversions from Metric Measures

Symbol When You Know Multiply by To Find Symbol

LENGTH

mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	1.1	yards	yd
		0.6	miles	mi

AREA

cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	

MASS (weight)

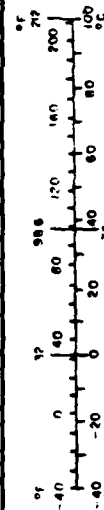
g	grams	0.005	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	

VOLUME

ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	cups	qt
		1.06	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
		1.3	cubic yards	yd ³

TEMPERATURE (exact)

C	Celsius temperature	9/5 (then add 32)	F	Fahrenheit temperature
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*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Monograph 28, Units of Weight and Measure, Price \$2.25, SD Catalog No. C-13 (11-78).

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CHAPTER I. PROJECT SUMMARY

1. OBJECTIVES AND PURPOSE.

- a. Objectives. The Consolidated Cab Display (CCD) is a system being procured by the Federal Aviation Administration (FAA) to test and evaluate a set of computing and display hardware and software intended for the support of Air Traffic Control Tower (ATCT) and Terminal Radar Control (TRACON) controllers. Two systems are under contract; one to be installed at the FAA Technical Center and a second one at the Atlanta ATCT/TRACON within the Southern Region (ASO). Considerable emphasis will be placed on the operational evaluation of the two systems by the FAA to determine system utility and design acceptability to the air traffic control (ATC) specialists. It is also expected that the need for CCD improvements will be identified during the evaluation period for inclusion in follow-on systems which may be procured for other ATCT/TRACON facilities.
- b. Purpose. This Project Planning Document provides the system overview and guidance for the development, installation, testing and evaluations of the CCD. It identifies the tasks to be accomplished, indicates offices of responsibility and provides schedule information for project activities. This document supplements contractual information in the area of project management which relates to both contractor and FAA activities. Wherever there is a conflict between this document and the CCD contract, the contract shall have precedence. The schedule information, included in Appendix 1, is organized so that it can be updated without making changes to the main body of this document.
- c. Project Support Procedures. The tasks identified throughout this document for the FAA Technical Center (ACT), ASO and other organizations will be more fully defined and assigned through the issuance of FAA agreement documents as follows:
 - (1) For ACT. The Systems Research and Development Service (SRDS) will submit Requests for Engineering Support to ACT. The ACT will respond with a coordinated Technical Program Document (TPD) to SRDS for support of the CCD project activities.
 - (2) For SRDS/AAT/AAF Inter-Service Agreements. The SRDS will develop inter-service agreements with Air Traffic Service (AAT) and Airway Facilities Service (AAF), as appropriate, for supporting CCD activities.
 - (3) For ASO. The SRDS will develop Intra-Agency Agreement(s), which will be coordinated with AAT and AAF, as appropriate, and submitted to ASO for supporting CCD project activities. The ASO identifies funding requirements for CCD support in coordination with SRDS, AAF and AAT. A Project Authorization (PA) will be issued by FAA Headquarters identifying and transferring needed funds.

- (4) For National Weather Service (NWS). It is anticipated that the CCD system of ASO will link with the NWS weather computer system for weather information. This will require an inter-agency agreement between FAA and NWS. This action will be coordinated by the Systems Development Division (ARD-400) with AAT, AAF and ASO.

2. RELATIONSHIP TO OTHER PROGRAMS. The CCD becomes a subset of the Terminal Information Display System (TIDS) program. The other project under TIDS include Flight Data Display (FDD) for automated presentation of flight data information. The TIDS program is evolving to identify and manage the integration efforts for the these projects. The actual system integration (hardware, software and procedures) under TIDS will not start until the CCD has been installed and evaluated at the FAA Technical Center. Another project, Runway Configuration Management (RCM), is to provide automation assistance in selecting the optimum runway configuration to maximize capacity at major airports. Study efforts will continue by the FAA Headquarters staff in defining the interrelations of these projects and to provide guidance for future system design consideration for ATCT/TRACON programs.

Another closely related area is the FAA Weather Program. Close coordination by the CCD Project Officer will be effected during CCD development with ARD-400 for Weather Program related activities.

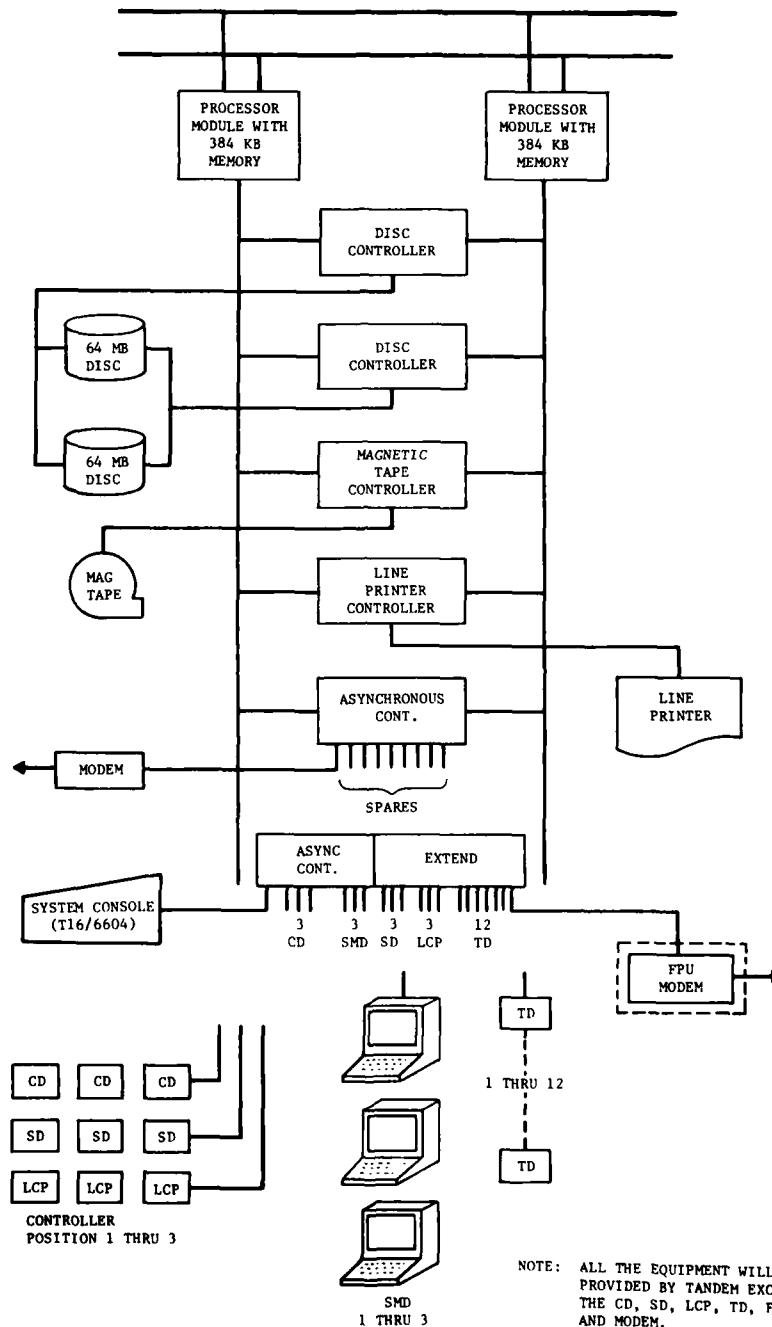
3. PROCUREMENT APPROACH. A contract was awarded to Electrodynamics, Talley Industries, 1200 Hicks Road, Rolling Meadows, Ill. 60008 on September 30, 1980. Electrodynamics is to meet the requirements defined under the FAA contract number DTFA01-80-C-20126 and the Engineering Requirements (ER) document FAA-ER-500-007, parts 1, 2, 3 and 7. Basically, the contract and associated documents establish the requirements for hardware and software design, programming, development, hardware fabrication, testing, delivery, installation, interfacing, and checkout of two CCD systems. The contract requires the contractor to utilize off-the-shelf hardware and software to the maximum extent possible, and to stay within the state-of-the-art where development, e.g., application software, is needed. Electrodynamics has subcontracted with the Analyst International Corporation (AIC) for application software, and with the Tandem Computers, Inc. for the central processors, peripherals and supporting software. The displays will be fabricated and assembled by Electrodynamics. However, the components for the displays are available from off-the-shelf equipment. Some fabrication and assembly may also be necessary for the Facility Processing Units (FPU) by Electrodynamics. The FPU provides the interfacing between the CCD central computer and the site demarcation box. Electrodynamics will also provide training and hardware/software maintenance support. The contract maintenance will commence after acceptance of both systems, and will be for a period not to exceed three years. Arrangements will be made with Tandem Computers, Inc. for training in the software they provide and for maintenance support for the Tandem hardware and software.

4. SYSTEM OVERVIEW. This overview is a functional description of the CCD system, oriented toward how it will provide support to the ATCT and TRACON air traffic control specialists. The system configuration includes central processors, disc and magnetic tape storage, facility processing unit(s) for interfacing with the facility systems (e.g., demarcation box), control equipment, and visual displays for the ATCT and TRACON control specialists. This is shown in Figure 1-1. The broad functional capabilities are shown in Figure 1-2. The capabilities are discussed in more detail in the following subparagraphs.

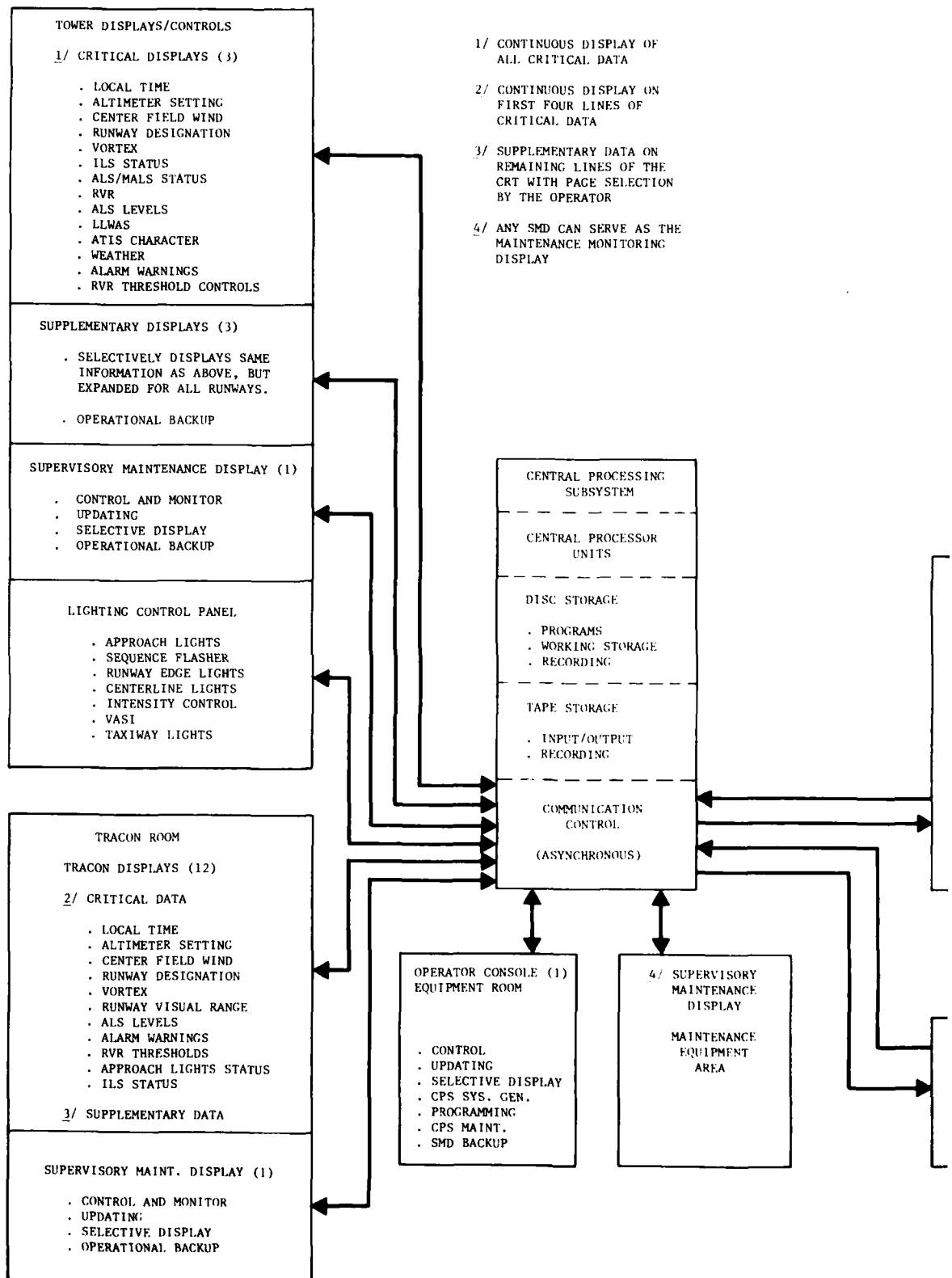
a. ATCT. In the tower cab, there will be located 3 critical displays (CD), 3 supplementary displays (SD), and 1 supervisory maintenance display (SMD) for the two research and development (R and D) systems. In addition, there will be 3 airport lighting control panels (LCP).

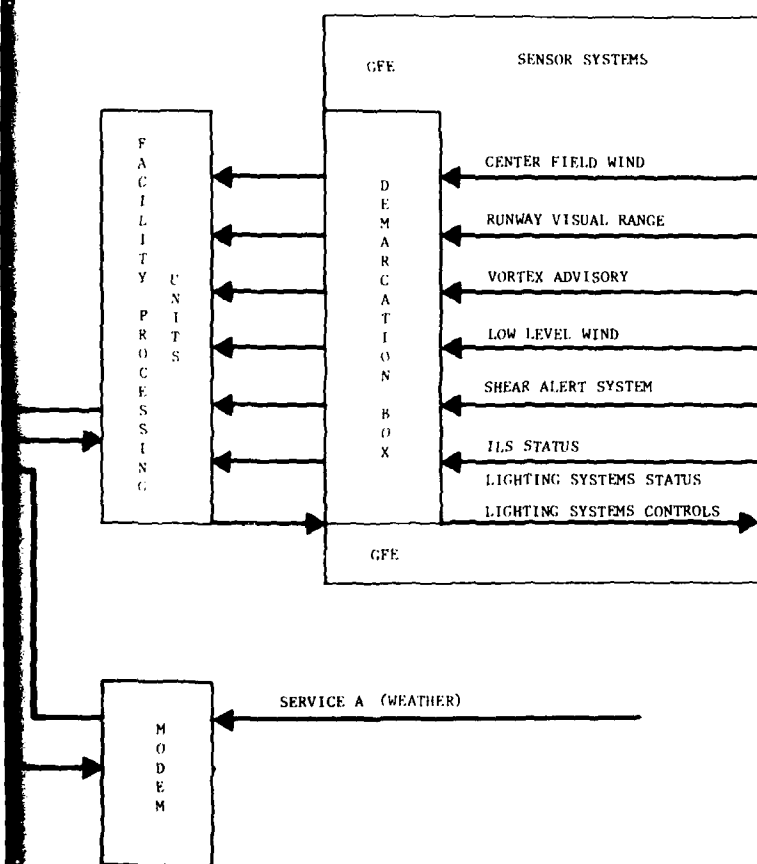
(1) Critical Displays. The CD is intended to consolidate most operational displays now used in the tower cab. It displays 9 lines of critical (very important and frequently used) information in a fixed format, not changeable through the CD as this display does not have a keyboard data entry and/or data modification capability. The brightness level is controlled automatically by ambient light, or it may be controlled manually. Certain information, e.g., runway visual range threshold values, is controllable by the tower control specialists through the use of function keys. The size of the viewing screen is approximately 5" vertical by 8 5/8" horizontal. The following information is displayed.

- (a) Time of day (hour, minutes, seconds), updated each second.
- (b) Barometric pressure.
- (c) Center field wind direction, speed and gust speed.
- (d) Designation of runways in use (up to 3 runways per CD).
- (e) Vortex advisory system (VAS) separation distance for each runway assigned.
- (f) Instrument landing system (ILS) equipment status when sensed to be inoperative.
- (g) Approach lighting system (ALS) and medium intensity approach lighting system (MALS) status when they are sensed to be inoperative.
- (h) Runway visual range (RVR), with a maximum of 3 values for each assigned runway. The control specialists may select an alarm limit for each of the 3 RVR's for each assigned runway. Both audible and visual blinking of the



**FIGURE 1-1
EQUIPMENT CONFIGURATION**





**FIGURE 1-2
FUNCTIONAL SYSTEM**

parameters displayed alarms the control specialists when the thresholds are reached.

- (i) Approach lighting system lighting levels.
- (j) Boundary surface wind direction and speed (low level wind shear alert system (LLWAS) data). A boundary surface wind direction and speed will be displayed (blinking) automatically if the boundary surface wind deviates from the center field wind by an LLWAS specified amount. The control specialists may manually select boundary location(s) for wind direction and velocity to be displayed.
- (k) Automated terminal information system (ATIS) character.
- (l) Weather messages and time of entry. When new weather information is received, an audible cue will occur and the message will blink until acknowledged.

Manual actions executed on the CD, e.g., acknowledgments and entering threshold values, will be logged through the central processing subsystem (CPS) for future event reconstruction.

- (2) Supplementary Display (SD). The SD provides more flexibility in its use than does the CD. A capability will be provided to manually request any one of 12 locally stored data pages to be displayed on the SD by depressing 1 of 12 function keys. Each page may contain up to 16 lines of information. A selected data page continues to be displayed and updated until a manual request for another data page is executed. The size of the display screen is approximately 5 3/4" vertical by 7 3/4" horizontal. The brightness is both automatically and manually controlled. Data entries can be made through the SD via the 12 function buttons and a special thirteenth button. Depressing the 13th button changes the use of the 12 function buttons from the page calling function to an inputting capability. This capability would normally be used for a remotely located SD for inputting short messages. The initial system will provide 5 specific pages of information for SD selection, plus the construction and display of weather messages by the CCD processing Service A weather information. Each facility may add additional pages (up to 7) for a total of 12 as the need arises. Each of the capabilities are discussed as follows.
 - (a) Backup Critical Display Data Page. This page is similar to the critical information displayed in a fixed format on the CD. In some cases, more space is provided for some items, e.g., runway information; and LLWSAS boundary winds are always displayed on the CD backup. When status data and surface observation data change on the page

being displayed, the changed data is highlighted (character blinking) until acknowledged on the SD.

- (b) RVR Data Page. This page displays all RVR data for all runways as a single display. The RVR sensors are used to provide test alerts or alarms connected with this page.
- (c) ILS Status Data Page. This page provides all the ILS and standby equipment status information for all runways (glide slope, localizer, inner marker, and outer marker). Change of status alarms, both audible and visual, are included.
- (d) ALS/MALS Data Page. This page provides status and light intensity settings for lighting for all runways. Change of status alarms, both audible and visual, are included.
- (e) Runway Lighting Data Page. This page provides status and intensity settings information on all selected runways for centerline, edge and runway end indicator lights. Change of status alarms, both audio and visual, are provided.
- (f) Service A Weather Data Page. Selected portions of the weather messages and time of entry (currency) will be displayed with this page. When weather information is updated, an audible cue will occur and the message character will blink until acknowledged.
- (g) Notification of Critical Data Changes. If critical data, e.g., RVR and LLWSAS, changes and reaches a threshold (system parameter) on a data page not being displayed, a signal (blinking characters) is shown on the display to alert the operator of a change occurring on the non-displayed (stored) data page.
- (h) Other Data Pages. Pages for displaying satellite reported weather, NOTAMs, administration type information, etc. may be added by the sites after system acceptance.

All manual entries and requests executed on the display are logged through the CPS for future event reconstruction.

- (3) Lighting Control Panel (LCP). An LCP is associated with one or more CDs, and where the runways are assigned to the CD(s) position, the lights on those runways come under control of the associated LCP. The panel size of the LCP is approximately 6½" by 6½". The LCP has controls for manually selecting the runway lighting, and their intensity levels from lights off, and 1 through 5 levels (level 5 is maximum intensity). The selection and lighting intensity settings are

dependent upon the capability of each lighting system at the airport. An indicator on the LCP panel is illuminated and displays the sensed lighting intensity as a status and acknowledgement from the CPS that the selected lighting intensity levels have been achieved. Also, a 15 minute timer and an alarm are provided for light intensity level 5 for the approach lighting system. The lighting brought under control of the LCP is as follows:

- (a) Approach lighting system (ALS) - up to 5 levels of intensity.
- (b) Sequence flasher lights (SF) - off/on control only.
- (c) Runway edge - up to 5 levels of intensity (if available).
- (d) Runway centerline - up to 5 levels of intensity (if available).
- (e) Touchdown zone (TDZ) - up to 5 levels of intensity (if available).
- (f) Medium intensity approach lighting system with runway alignment indicator lights (MALSR) - intensity levels of low, medium and high.
- (g) Visual approach slope indicator (VASI) - intensity levels of low, medium and high.

A capability is provided to log all manual requests through the CPS which are executed on the LCP for future event reconstruction.

- (4) Tower SMD. One SMD is located in the tower cab for system maintenance, monitoring and control. It may also be used as a backup to the other displays, i.e., the CD and SD. The functions to be performed through the SMD are discussed under subparagraph "c" below.
- b. TRACON Display (TD). A total of 12 TRACON displays will be provided for supporting the TRACON control specialists. The size of the viewing area is approximately 6 1/8" by 6 1/8". Up to 16 lines of information, 32 characters each, may be displayed. In general, the TD in the TRACON behaves like the CD and SD in the tower cab.
 - (1) Fixed Format Display. The top 4 lines contain similar critical data in the format as displayed on a critical display in the tower cab.

(a) Information included on the first line:

- 1 Time of day.
- 2 Altimeter setting.
- 3 Wind direction/speed/gust speed.
- 4 ATIS character.

(b) Information included on lines 2 through 4, i.e., for each of three runways.

- 1 Name of runway.
- 2 Vortex advisory system.
- 3 Alarms for ILS and ALS.
- 4 Runway visual range.
- 5 Lighting systems levels.

(2) Data Paging. Lines 5 through 16 may be used for data paging. The data paging is similar to the capability described above for the tower cab supplementary display. The data pages initially provided are as follows:

- (a) RVR information.
- (b) ILS status.
- (c) ALS/MALS.
- (d) Runway lighting.
- (e) Service A weather.
- (f) Pages for displaying satellite reported weather, NOTAMs, administrative type information, etc. may be added by the sites after system acceptance.

The RVR, ILS status and runway lighting status data pages will not have alarms or alerts associated with them. The weather page will have alarms/alerts for LLWSAS and new weather messages.

(3) TRACON SMD. One SMD is located in the TRACON room for system maintenance, monitoring and control. It may also be used as a backup for the TRACON displays. The functions to be performed through the SMD are discussed under subparagraph "c" below.

- c. Supervisory/Maintenance Displays (SMD). There will be 3 SMD's provided to be located 1 each in the tower cab, TRACON room and the maintenance area. It is to be a commercially available data terminal with a nominal 12" diagonal display area, and a full standard ASCII alphanumeric keyboard. The SMD is to be used for supervisory control and monitoring of the system, updating and selectively displaying information. The main functions that can be performed with the SMD are as follows:
- (1) Log On/Log Off. Security is provided for entering the system; a valid identification and password are required.
 - (2) Data Paging. Any two supplemental data pages may be displayed on the SMD. The supplemental data pages for display on the SD to be provided with the initial system were discussed under "a" above, and may be displayed on the SMD.
 - (3) Enable/Disable Sensor Data. A capability to disable parameter data collected by sensors from being displayed, and re-enabling the displaying of the sensor collected data.
 - (4) Manual Data Entry. A capability to manually enter the following types of data:
 - (a) Critical Data. Manually enter sensor data to override the data collected by a sensor.
 - (b) Adaptation Parameters. Set values to adaptation parameters.
 - (c) Supplemental Data. Enter supplemental data into the supplemental data pages, to format or reformat the supplemental data pages, and to alter the types of alarms and alerts on individual data elements.
 - (5) Runway Assignment. A capability to assign runways to specific critical displays and lighting control panels.
 - (6) Display Configuration. A capability to execute predetermined display configurations, and to create a display configuration and add it to the configuration table.
 - (7) Text Messages. A capability to send free form text messages to other supervisor display/terminals and the CPS operator's terminal.
- d. System Console. The system console consists of a keyboard and printer. The printer automatically prints hard copy system messages or other information requested by the operator. In addition to using this position for monitoring and control, entries may be made to update system and operational data, to direct the use of system resources such as printing information on the main

printer, and for accomplishing input/output functions required for system management and maintenance.

e. System Features. The following major features will be provided as a part of the system.

- (1) Data Recording. Recording of ATC specialist's entries and data displayed for event reconstruction at a later time.
- (2) Security. Three levels of control for data access and for operational data modification.
- (3) Equipment Redundancy. The system architecture prevents no loss of data to the ATC specialists if there is single component failure of equipment.
- (4) Fail Safe. Provides non-stop processing and display in the event of failure of a central processor unit, disc unit, power supply, etc.
- (5) Fail Soft. Provides continued system operation at predefined reduced levels with multiple component failures.
- (6) Error Detection and Reporting. The operating system includes these functions.
- (7) System Recovery. Self-recovery without loss of any data and provides system regeneration automatically.
- (8) Backup Power. The Tandem-provided equipment automatically provides temporary power (batteries) in the event of the loss of the main power source to protect stored data (memory protect) for a period of 1.5 to 4 hours. Updating and processing does not occur while the system is operating on battery power. Built-in batteries, charged during the time when the AC input power supply is operating, will supply sufficient power to maintain the stored data in the CD, SD and TRACON displays for 15 minutes minimum.
- (9) Display Legibility. Provides very high legibility of display data in each environment.
- (10) Satellite Facility Interface. Provides for communications between the CPS and remote sites through dedicated and/or shared land lines with a maximum data rate of 4,800 bits per second.
- (11) Expandability. The system architecture design permits on-line system expansion, display data reformation and data base expansion.

(12) Maintenance. Permits on-line system repair and maintenance diagnostics, e.g., card removal and replacement, power supply failure, and component removal from the system while on-line.

(13) Maintenance Monitoring. Includes a system maintenance monitoring station. This SMD may be used as a backup to the system console as well as for all other SMDs.

5. PROJECT MANAGEMENT ORGANIZATION AND AUTHORITY. This is the principal guidance document for the project management during the acquisition and evaluation of the CCD system. The following subparagraphs assign the principal project management authority and identify the organizations which are to provide project management assistance and engineering/technical support. Chapter 2, Project Management, defines the detailed CCD project responsibilities of the participating organizations.

a. Project Management Assignment. The Systems Research and Development Service (ARD-100) has been assigned overall CCD project management responsibility. Within ARD, the Terminal Branch (ARD-120) is the organization where the Project Officer is assigned. He is delegated the authority to direct the development, acceptance testing and operational evaluation of the CCD systems. He will coordinate all project management activities, as appropriate, with Airways Facilities Services, Air Traffic Services, FAA Technical Center, Aeronautical Center, and the Southern Region wherein the operational ATCT/TRACON site will be located. The Project Officer will convene and chair meetings and he may task organizations that are required to support the CCD project. The Project Officer provides progress reports to the Section Chief of the Systems Analysis Section of ARD-120.

b. Project Support. The Chief of ARD-140 at the FAA Technical Center designates a person as Assistant Project Officer. The ARD-140 organization thus provides direct and continuous project support. The Assistant Project Officer, representing the Project Officer, has direct interface with ACT-200 and, as appropriate, other ACT organizations to accomplish CCD project activities. The Southern Region will appoint a Project Coordinator for interfacing with the Project Officer, responding to project tasking and for coordinating the project activities of the Region. Other organizations (AAT-100, AAF-300 and APT-300) will each appoint a liaison person for coordinating CCD activities within their organizational elements and for executing the project tasks assigned by the Project Officer, consistent with this Project Planning Document and inter-service agreements.

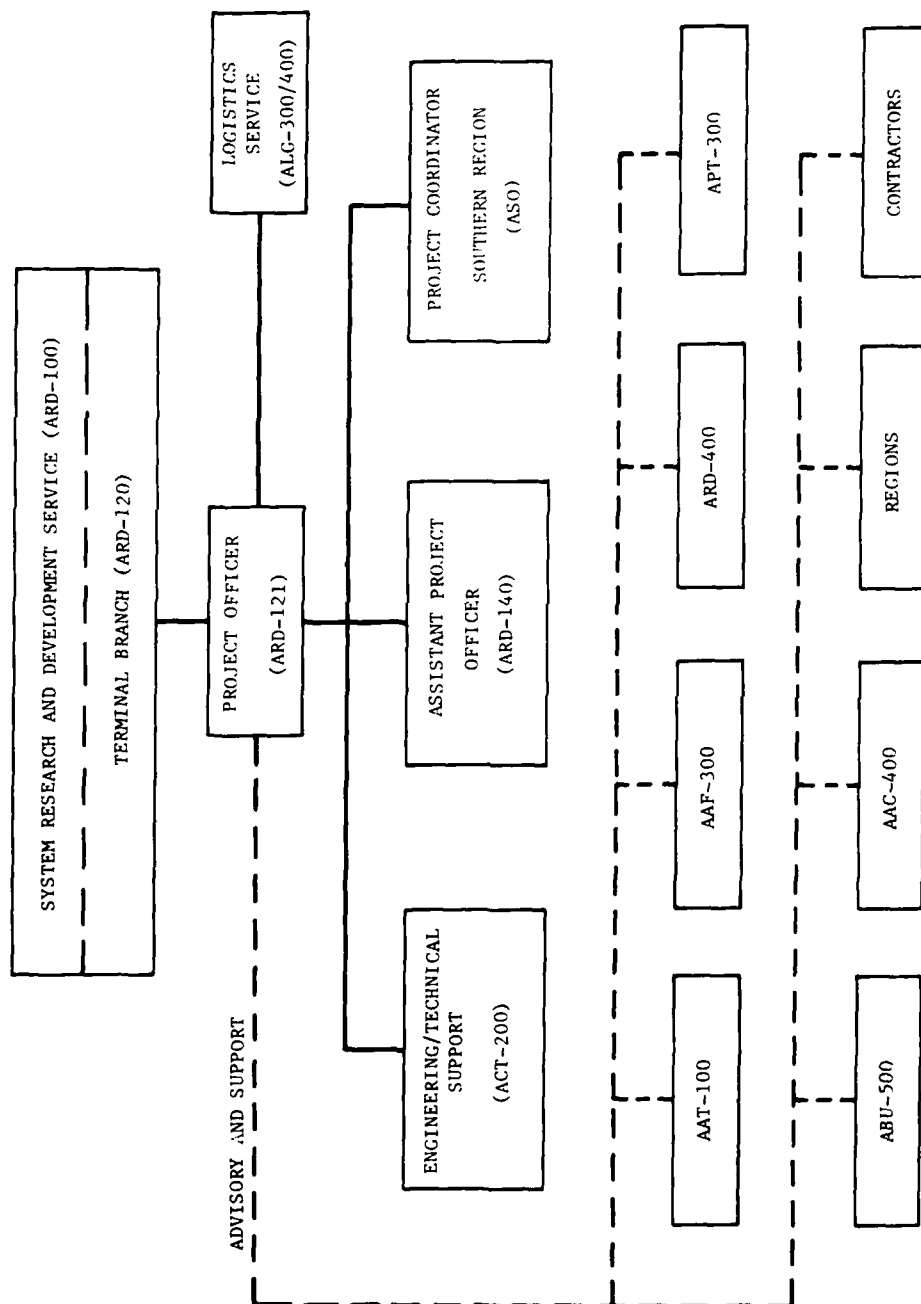
c. Engineering/Technical Support. Several branches within ACT-200 provide engineering/technical support to the CCD project. This support, defined more fully in subsequent chapters, extends across many CCD project activities. The ACT-200 Division Chief submits coordinated monthly reports directly to the ARD-100 Division Chief

on the CCD project activities of the organization. The reports will make specific references to progress in accomplishing CCD project tasks and functions, identify existing problems, and make recommendations where needed for solving problems and for improving project activities.

d. Project Management Organization. The project management organization is shown as Figure 1-3, CCD Project Management Organization. This Figure shows the organizations participating in project management and project support on a day-to-day basis (solid lines), and those organizations exercising advisory and supporting roles (broken lines).

6. SYSTEM FUNDING. The funds for this procurement are included in the Facility and Equipment (F&E) FY-1979 Congressional Budget submission.
7. SECURITY REQUIREMENTS. The CCD is not a classified project. Its procurement does not require access to classified information by contractor employees. The contract is not to be considered a CLASSIFIED contract within the meaning of Handbook 1600.2A, Classification, Reclassification and Control of National Security Information, dated February 13, 1973. Physical security and computer security systems for the CCD will be provided to insure: protection against unauthorized persons having physical entry or access to any part of the CCD system, including access to hardcopy records as well as to the processing system; and protection against the elements of weather, electro-magnetic interferences and other phenomena. System processing security provided by software was described under Chapter 1, Paragraph 4, System Overview.
8. PROJECT PLANNING DOCUMENT MAINTENANCE PROCEDURES. ARD-120 has overall responsibility for maintaining and updating this document. ARD-121 has been delegated the responsibility for conducting and coordinating staff actions for updating actions. When organizations within the FAA have recommended changes, they are to advise ARD-120, attention CCD Project Officer, in writing through appropriate channels. Follow-on actions and coordination are to be completed by the Project Officer and if approved, the changes are to be reflected in the next update of this document. Where a change involves only schedule information, only the Appendix will be updated and distributed.

9-20. RESERVED



**FIGURE 1-3
PROJECT MANAGEMENT ORGANIZATION**

CHAPTER 2. PROJECT MANAGEMENT

21. PROJECT DIRECTION. This chapter defines the detailed responsibilities of the various FAA organizations and participants during all phases of the acquisition, implementation and evaluation of the CCD. It defines the responsibilities of the principal project management organization, ARD-120, the participating organizations at the FAA Headquarters, and at the ACT, AAC, ASO, other regions, and contractors. The FAA documents which define management responsibilities are:
- a. Handbook 1100.1, FAA Organization - Policies and Standards.
 - b. Handbook 1100.2, FAA Organization - FAA Headquarters.
 - c. Handbook 1100.5, FAA Organization - Field.
 - d. Order 1100.121, Management of Air Traffic Control Automation Subsystems.
 - e. Order 1100.127, Airway Facilities Sector Configuration.
 - f. Order 1100.134, Maintenance of National Airspace System Automation Subsystems.
 - g. Order 1100.139, Air Traffic and Airway Facilities Responsibilities at NAS Computer-Equipped Terminal Facilities.
 - h. Order 1600.6, Protection of Agency Property.
 - i. Order 1600.24, Use of Recording or Monitoring Equipment and Practices.
 - j. Order 1600.54, Security of FAA Automatic Data Processing Systems and Facilities.
 - k. Handbook 1800.1, National Airspace System Management.
 - l. Order SM 1800.8, System Maintenance Service Planning, Programming, and Budgeting Procedures.
 - m. Order 1800.8, National Airspace System Configuration Management.
 - n. Order 1800.30, Development of Logistic Support for FAA Facilities and Equipment.
 - o. Order 6000.10, Definition of the Terminal Automation Program.
22. PARTICIPATING ORGANIZATIONS. For the SRDS to accomplish its assigned mission, coordination must be effected with all offices, services, AAC, ACT, ASO and other organizations that have responsibilities in the acquisition and implementation of the CCD. The functions and responsibilities enumerated below must be accomplished (as a minimum) to

ensure the timely completion of all actions that make up the complete project.

a. Terminal Branch (ARD-120).

- (1) Provides the Terminal Program Manager.
- (2) Provides the CCD Project Officer.
- (3) Provides project guidance to all offices, services, AAC, ACT and ASO for the development, acquisition, implementation, testing and evaluation activities.
- (3) Convenes meetings and acts as chairman for special working groups and boards established for supporting the CCD project activities.
- (4) Monitors and is responsible for the technical performance of contractors, with assistance from (primarily) ARD-140, ACT-200, ALG-300 and 400 and, as requested, the ASO in the design, development, production, testing, installation, system integration and evaluation for the CCD.
- (5) Provides the principal plant representation for the FAA (Technical Officer) on the CCD contract as outlined in the Contracting Officer's letter of designation.
- (6) Conducts design reviews and provides technical guidance to the contractor.
- (7) Reviews and records recommendations for system changes and enhancements which may be made during development; determines the phasing for incorporating approved changes/enhancements into the CCD systems.
- (8) Maintains the currency of the Project Planning Document and prepares, analyzes and distributes planning and scheduling information to all interested organizations; establishes systems for feedback information for assisting in the management of the CCD project.
- (9) Ensures the configuration documentation is current for all hardware and software items that make up the CCD and provides needed documentation for system acceptance and evaluation. (The Project Officer approves all contractor developed documentation with the review assistance from AAF, AAT, ALG, ARD-140, ACT-200, ASO and the AAC, as appropriate.)
- (10) Provides site preparation standards and requirements from contractor provided information (e.g., power, air conditioning and equipment space requirements) to ARD-140/ACT-200 and ASO for installation of the CCD.

- (11) Applies or reapplies, in conjunction with AAF and ABU, funds identified as direct costs in accordance with established budgetary procedures.
- (12) Reviews and approves CCD acceptance criteria, with support from AAT, ARD-140, ACT-200 and ASO in accordance with contractual requirements. This includes acceptance of the documentation associated with the CCD.
- (13) Coordinates, with assistance from AAT and AAF, the development of the engineering and operational evaluation criteria, procedures and plans.
- (14) Coordinates with the TIDS Program Manager for CCD/TIDS program activities.
- (15) Coordinates and approves system testing for factory and site acceptance, and for engineering and operational evaluations prior to the turnover of the ACT CCD system to the TIDS program and the Atlanta system to ASO.
- (16) Identifies requirements and resources necessary to support the testing and evaluation efforts.
- (17) Insures that logistic and maintenance support requirements, in coordination with AAF, ALG and the AAC, are provided in accordance with the CCD contract, and are funded and delivered in time to permit effective engineering and operational evaluation and use of the CCD.
- (18) Receives and evaluates advice from the research and development elements of ARD on future developments as they may impact the CCD development activities.

b. Programming Development Branch (ARD-140)

- (1) Provides an Assistant Project Officer and technical support during all phases of the CCD project.
- (2) Coordinates and interfaces with ACT-200 and other ACT organizations on project activities.
- (3) Coordinates with ACT-200 for conducting evaluation and design reviews, and participates in such reviews, to ensure that functional requirements are met and for assessing the CCD maintainability and reliability.
- (4) Supports the Project Officer in the review of CCD documentation for its adequacy and correctness.
- (5) Provides support to and coordinates with ACT-200 for the development of the engineering and operational evaluation criteria and procedures.

- (6) Provides technical and other support for system tests conducted at the factory, and at the CCD sites.
- (7) Provides system sizing and other analysis specified by the Project Officer in support of the CCD project on a task basis.
- (8) Coordinates with ACT-200 and other appropriate ACT organizations for the facility location to house the CCD system.
- (9) Provides support to ACT-200 and other ACT organizations in the planning for the CCD installation and system checkout.
- (10) Provides overall monitoring and contractor interface for the FAA Technical Center on-site activities performed under the CCD contract.
- (11) Coordinates with and supports ACT-200 and other ACT organizations, as appropriate, on the following activities.
 - (a) Delivery of items under the CCD contract to the FAA Technical Center.
 - (b) Establishing financial and item management and accountability for all CCD property at the FAA Technical Center.
 - (c) Arranging for CCD contractor and Tandem support for the hardware and software maintenance activities.
 - (d) Maintaining a library for all system and software documentation for the CCD system at the FAA Technical Center.
 - (e) Developing and implementing appropriate physical security controls for the protection of the CCD system at the FAA Technical Center.
- (12) Coordinates and manages for the Project Officer the engineering and operational evaluation conducted by ACT-200 at the FAA Technical Center. ARD-140 also provides support, as required, for these evaluations.
- (13) Provides membership to groups, committees and boards, as may be required.

c. FAA Technical Center (ACT-200)

- (1) Provides engineering/technical support during all phases of the CCD project under supporting agreements as defined under paragraph 1.c., chapter 1, above.

- (2) Acts as a principal staff to the Project Officer for conducting evaluations and design reviews to ensure that functional requirements are met and for assessing the CCD maintainability and reliability.
- (3) Supports the Project Officer in the review of CCD documentation for its adequacy and correctness.
- (4) Provides engineering/technical and other support for system tests conducted at the factory, and acceptance testing at the ACT site.
- (5) Provides any development testing and analysis specified by the Project Officer in support of the development of the CCD on a task basis.
- (6) Provides membership to groups, committees and boards, as may be required.
- (7) Arranges for the facility to house the CCD system.
- (8) Insures that the following activities are accomplished at the FAA Technical Center. This is accomplished in coordination with ARD-140.
 - (a) Developing estimates and facility report for facility preparation and logistical support and submits them to the CCD Project Officer.
 - (b) Preparation of the facility for the CCD system.
 - (c) Developing and implementing appropriate physical security controls for the protection of the CCD system at the FAA Technical Center.
 - (d) Delivery verification of items under the CCD contract to the FAA Technical Center.
 - (e) Establishing financial and item management and accountability for all CCD property at the FAA Technical Center.
 - (f) Providing technical monitoring of on-site equipment and software maintenance activities.
- (9) Maintains a library for all system and software documentation for the CCD system at the FAA Technical Center.
- (10) Supports the Project Officer in the development of training plans for the CCD.

- (11) Develops engineering and operational evaluation criteria, procedures and plans, and conducts the tests for the evaluations of the CCD system at the FAA Technical Center. The planning and testing is accomplished with the support and management from ARD-140.
- (12) Provides inputs for the CCD Project Planning Document and carries out assigned tasks defined within this document and/or by an approved TPD.
- (13) Insures that supplies and working equipment are provided which are not covered under the CCD contract or not being procured by the Washington Headquarters Procurement Office.
- (14) Insures that GFE, as may be required, is provided for the CCD project.
- (15) Assists the Project Officer for the continuation of hardware and software maintenance prior to the expiration of the contract maintenance.

d. Southern Region (ASO)

- (1) Provides a Project Coordinator and technical support during applicable phases of the CCD project.
- (2) Provides membership to groups, committees and boards, as may be required.
- (3) Participates, as requested, in the review of CCD documentation for its adequacy and correctness.
- (4) Provides technical and other support for system tests conducted at the factory, and site acceptance testing and operational evaluations at the Atlanta CCD site.
- (5) Develops a comprehensive Installation and Cutover Plan (identified as Facility Report in the CCD contract) for the CCD system at the Atlanta ATCT/TRACON as scheduled in Appendix 1 of this document. The plan will be prepared jointly by ASO and AAF.
- (6) Provides the facility to house the CCD system, including the necessary facility preparation.
- (7) Develops and implements appropriate physical security controls for the protection of the CCD system.
- (8) Verifies the items delivered to the CCD site under the CCD contract.

- (9) Provides for technical monitoring of on-site activities performed under the CCD contract.
 - (10) Develops portions of a detailed operational evaluation criteria and procedures, in coordination with the Project Officer and AAT-100; and conducts the tests in accordance with the approved plan. These activities are accomplished with support from ARD-140 and ACT-200.
 - (11) Coordinates contractor (Electrodynamics and Tandem) oncall hardware and software contract maintenance activities with the Project Officer following system acceptance at the Atlanta ATCT/TRACON.
 - (12) Provides supplies and working equipment not provided under the CCD contract or being procured by the Washington Headquarters Procurement Office.
 - (13) Supports the Project Officer in the development of training plans for the CCD.
 - (14) Establishes financial and item management control and accountability for all FAA property received for the CCD system.
 - (15) Provides inputs for this Project Planning Document and carries out assigned tasks defined within this document and/or by intra-agency agreement(s).
 - (16) Maintains CCD site documentation.
 - (17) Maintains the CCD hardware and system at the end of the contract maintenance period.
 - (18) Coordinates with local airport authorities/operators for field lighting and other CCD interfaces required.
 - (19) Assists AAT-100 and AAF-300 in the development of a detailed CCD Transition and Utilization Plan. The planning is accomplished, in coordination with the Project Officer, if the CCD system is to remain at the Atlanta ATCT/TRACON for active support to ATC operations after operational evaluation.
- e. Office of Personnel and Training (APT)
- (1) Provides membership to special committees, groups and teams as may be necessary for support of the CCD project for personnel and training matters.
 - (2) Provides assistance and evaluates training requirements for the CCD.

- (3) Reviews and coordinates personnel requirements, as required, for the CCD positions.
- (4) Provides training resource requirements, including funds, and arranges for training to meet requirements.
- (5) Provides inputs to this CCD Project Planning Document and responds to planning activities contained herein that apply to APT.

f. System Research and Development Service (ARD-400)

- (1) Provides support to the Project Officer by defining all weather information inputs and display requirements.
- (2) Interfaces and coordinates with organizations which provide weather information and makes arrangements with them for weather reporting for CCD processing and display.

g. Logistics Service (ALG-300/400)

- (1) Provides all necessary procurement actions for the CCD.
- (2) Provides contract administration at FAA Headquarters and in-plant.
- (3) Provides guidance, as requested, to the AAC, ACT and ASO for appropriate CCD property controls and records maintenance.
- (4) Determines adequacy of contractor's quality and reliability programs and inspection systems; furnishes quality/reliability assistance for in-plant quality and reliability assurance.
- (5) Participates in project reviews and technical meetings, as requested.
- (6) Provides assistance when requested for conducting factory acceptance testing.
- (7) Provides guidance and direction, as necessary, for the packing, insuring and shipping of the CCD system.
- (8) Provides inputs to this Project Planning Document; carries out assigned tasks.
- (9) Provides membership, as required, to committees, groups and boards established in support of the CCD.

h. Airway Facilities Services (AAF-300)

- (1) Procures and provides GFE, as may be required, for the CCD project.

- (2) Provides membership to special committees, groups and teams, as requested.
- (3) Provides appropriate inputs to this Project Planning Document and responds to activities contained herein which pertain to logistical support.
- (4) Supports CCD system design and hardware maintenance documentation reviews and acceptance testing activities, as requested.
- (5) Supports the Project Officer for acquiring needed funds for the CCD project.
- (6) Develops a comprehensive Installation and Cutover Plan (Facility Report) for the CCD system at the Atlanta ATCT/TRACON as scheduled in Appendix 1 of this document. The plan will be prepared jointly by AAF and ASO.
- (7) Develops the logistical and maintenance supporting portion of a CCD Transition and Utilization Plan for the ASO site. This planning is coordinated with the Project Officer, AAT-100 and ASO, and is accomplished if the CCD system is to remain at the Atlanta ATCT/TRACON for active support to ATC operation after the operational evaluation.

1. Air Traffic Service (AAT-100)

- (1) Provides technical and other support, as operational advisor to the Project Officer, to ensure that intended support to the ATC specialists is met with the CCD system, and provides appropriate interfaces with ASO for the Project Officer.
- (2) Supports software documentation reviews.
- (3) Provides support to acceptance testing and operational evaluation activities.
- (4) Reviews training plans and courses to insure the training requirements are met for ATC specialists.
- (5) Provides membership to special committees, groups and teams as may be necessary.
- (6) Provides appropriate inputs for this Project Planning Document and responds to activities contained herein which pertain to AAT areas of responsibility.
- (7) Develops a CCD Transition and Utilization Plan, with support from AAF-300 and ASO, for the Atlanta ATCT/TRACON site. This planning is accomplished, in coordination with the Project Officer, if the CCD system is to remain at the Atlanta site

for active support to ATC operations after operational evaluation.

j. Office of Budget (ABU-500)

- (1) Provides funds for the acquisition and implementation of the CCD.

k. Aeronautical Center (AAC-400)

- (1) Conducts provisioning conferences in accordance with the CCD contract and provides recommendations to the Project Officer for provisioning.
- (2) Accomplishes provisioning activities for the CCD project, and provides normal depot support after system acceptance.
- (3) Provides membership to special groups, committees and boards as may be required for the CCD project.

l. Other Regions. The regions stay abreast of CCD plans and activities, and they support operational evaluations, as requested.

m. Contractors. Each contractual relationship is to specifically establish the responsibility of the contractor and is not to detract from or compromise the FAA overall management responsibilities.

- (1) CCD Contractor. Carries out the responsibilities in accordance with the terms of the CCD contract.
- (2) ARD-100 System Support Contractor (The MITRE Corporation). Supports the Project Officer during design reviews and, as requested, for other engineering and technical activities.

n. Boards, Groups and Committees. The Project Officer may appoint boards, groups or committees to assist in the review of special areas and problems and to make recommendations for management actions.

23. CONFIGURATION MANAGEMENT. The configuration management procedures for the CCD hardware and software will be implemented following critical design approval within the broad framework of the FAA procedures which exist for NAS En Route Stage A and Automated Radar Terminal System (ARTS) III and II. These procedures are identified in FAA Order 1800.8D, National Airspace System Configuration Management. However, variations from the existing procedures are anticipated because of the uniqueness of the CCD. It is an R&D system for operational evaluation.

a. Hardware and Software from Tandem Computers, Inc. The hardware and support software provided by the subcontractor, Tandem Computers, Inc., are general purpose and with emphasis on

commercial usage. Tandem maintains configuration control of their standard hardware and software items, and periodically update their systems through engineering changes. Electrodynamics will include in their configuration management plan the procedures for receiving continuous engineering support from Tandem, i.e., receiving notification and implementation of hardware engineering changes and updating of the operating system (new versions) and other software from Tandem. The FAA approves or rejects changes offered by Tandem. Following system acceptance at each site, the Research and Development Service (SRDS) makes arrangements with Tandem for this engineering support during the R & D activities.

- b. Hardware and Software Developed by Electrodynamics. Electrodynamics is developing applications software and fabricating and assembling hardware items, principally controller display hardware. These software and hardware items will be brought under FAA configuration control as defined in the following paragraphs.

24. CONFIGURATION CONTROL. The utilization of the configuration management process and functions for the CCD project management are required during the life cycle of the system. The SRDS has primary responsibility for configuration management during production and testing of the systems. This responsibility transitions to the TIDS Program at the completion of system acceptance and evaluation for the ACT system. A configuration management agreement will be required between SRDS and ASO following operational evaluation of the CCD at the Atlanta site. The FAA configuration management procedures will be followed as practical during the evaluation and R&D period.

- a. Configuration Control During Production, Testing and Evaluation Phases. The CCD contractor is the Configuration Manager of the CCD system during its development, production, testing and acceptance phases. During the evaluation phases, ARD-120 becomes the CCD Configuration Manager. The CCD design data serves as the principal document(s) for baselining and configuration controlling the system during these phases. This follows the completion of the FAA's critical design review(s). The contractor requires configuration control procedures for his internal configuration management. These procedures are reviewed and approved by the FAA and are useful to the FAA in-plant team for the technical management and monitoring of the contractor's work. The Project Officer, or his designated representative, participates in reviews of change proposals. All changes are approved by the FAA prior to implementation by the contractor.
- b. Configuration Control After System Evaluation. The CCD system at the ACT transitions to the TIDS program for configuration management and control. SRDS develops a joint SRDS/ASO Order for the CCD at the Atlanta site to define the local authority for configuration management, and to assign responsibilities and outline the configuration management procedures to be used. The joint procedures will operate within those defined in FAA Order

1800.8D. The FAA Configuration Control forms will be used locally, and change proposals are coordinated in the FAA Washington Headquarters before their implementation.

25. QUALITY ASSURANCE MANAGEMENT

- a. During Development. The contractor establishes a quality control (QC) program for the two engineering models to insure that the required quality of the software, hardware and interfaces are met and that the CCD system meets functional, performance, design and maintainability requirements. The contractor QC program and procedures are reviewed by ALG, with support from the Project Officer and the FAA Technical Center, to insure that the program meets the requirements of FAA-STD-013 and FAA-ER-500-007. The contractor implementation of the QC program will periodically be reviewed by the Project Officer and ALG during development and production of the CCD to insure conformance to the FAA standards and engineering requirements. In addition, QC considerations will be principal items of review during formal and informal reviews of the CCD development and during testing. Inspections may be made of equipment components and materials used in the production of the equipment to insure compliance with the specifications covering procurement. Software quality control procedures will be addressed in the contractor's configuration management and quality control plans.
- b. During Operational Life. Quality control of the CCD continues during its operational life. The SRDS, with assistance from ASO, assumes responsibility to apply established FAA QC standards and procedures for both hardware and software for the system at the Atlanta site. The CCD at ACT comes under the TIDS program for quality control.

26. - 30. RESERVED

CHAPTER 3. PROJECT SUPPORT

31. GENERAL SUPPORT. Although the contract with Electrodynamics is a "turn key" type, there are areas of specific project support required by the FAA during all phases of the project. Certain support is required during system design and production, for the pre-installation activities in anticipation of systems installation at the two FAA sites, the development of evaluation plans, and post-installation support which covers engineering and operational evaluations of the systems. These project support activities and responsibilities, covered in the following paragraphs, are more specific than those defined in Chapters 1 and 2, and may in some cases impact the CCD system design considerations.
32. SUPPORT DURING SYSTEM DESIGN AND PRODUCTION. Primary support during this period is monitoring the system design and production activities, and providing the Contractor with technical guidance, as required, to insure that the functional and schedule requirements are met, and that the project is within approved funding levels. This is generally accomplished by the Project Officer, with technical assistance from ACT-200, ARD-140 and the FAA Headquarters Staff. The following areas are typical of support required, but is not intended to be all inclusive.
- a. Program Reviews. These may be held as often as monthly, depending upon project problems and progress. The Project Officer schedules the reviews with the contractor and notifies the appropriate offices listed in chapter 2. The FAA review team structure for each meeting will depend upon the principal subjects to be reviewed.
 - b. Preliminary and Critical Design Reviews. These will be scheduled by the Project Officer in coordination with the CCD Contractor. Principal supporting offices include AAF-300, AAT-100, ARD-100, ARD-400, ACT-200, ALG-400 and MITRE. These organizations will provide support as required.
 - c. System Data Requirements. Although the ER specifies data requirements (e.g., data base, system parameters, and interfacing), some areas require review and updating to take into account the current terminal data usage for air traffic control. Some principal examples of information to be provided/validated are as follows:
 - (1) Minimum and maximum values for data recording and event reconstruction.
 - (2) Priority list of critical functions for processing in a system fail soft mode.
 - (3) Actual data base information and their values for use in system design, production, and testing.

- (4) Poll list with polling priorities for processing and displaying functional information.
- (5) Update the data rates and communication lines information.
- (6) Adaptation data for each of the two sites.
- (7) Other system processing parameters as needed.

The principal organizations providing project support in these areas include AAT-100, ACT-200, ARD-140, AAF-300 and, as required, the ASO.

- d. Weather Information. Reviews are required to insure that the CCD design includes the latest formatting and reporting characteristics, including sources and methods of inputting. ARD-400, AAT-100, and ASO provide project support on all CCD weather processing activities.
- e. Interfacing with Current Systems. An update list of ports, signals and parameters for the demarcation box will be provided. (The ACT does not have a demarcation box at this time for the experimental CCD system.) The AAF-300, ASO, ARD-140 and the ACT-200 provide project support for all system interface problems. The CCD interfacing with GFE at the Atlanta site must be carefully planned and engineered to avoid disruption of existing data display support to the air traffic control functions and provide safeguards against losing current equipment certification during CCD installation, system testing, and operational evaluation. These areas will be carefully covered in the ASO/AAF Installation and Cutover Plan to be developed prior to the CCD system delivery to the Atlanta site (see schedule in Appendix 1).
- f. Validation of Hardware Configuration and Sizing. Reviews of the system configuration and sizing studies are needed to insure that the proposed hardware will support the processing activities and meet the engineering requirements. ACT-200 and ARD-140 at the FAA Technical Center provide the principal project support in these areas.

33. PRE-INSTALLATION SUPPORT. The pre-installation project support is primarily the required actions by the ACT-200 and ARD-140 at the FAA Technical Center, and support from ASO. It includes the following activities which are coordinated with and approved by the Project Officer.

- a. Tasks Required for Both CCD Sites (ASO and ACT).
 - (1) Updating adaptation data.
 - (2) Definitive definition of the technical interfacing between contractor-provided hardware and software and the equipment (GFE) at each site.

- (3) Providing installation, logistical and on-site testing support to the Contractor. (These areas are covered in more detail in subsequent chapters.)
- (4) Providing personnel for training and for on-site acceptance testing.

b. Tasks Required by ASO for the CCD Site at the Atlanta ATCT/TRACON.

- (1) Determining positioning of the CCD displays for ATCT and TRACON use, taking human factors and expected usage into consideration. The ACT-200 provides expertise in human factors study efforts.
- (2) Developing the comprehensive Installation and Cutover Plan as scheduled in Appendix 1, Schedules. This is accomplished jointly between ASO and AAF.
- (3) Completing an Evaluation Plan for the operational evaluation and use of the CCD system. The plan will include evaluation criteria, procedures, schedules and resource requirements. It will show how the facility will conduct the evaluation while continuing the current ATCT/TRACON air traffic control operations. As support to the ASO, ACT-200 and ARD-140 develop major portions of the plan dealing with the operational evaluation criteria and procedures. A comprehensive outline for the plan content will be provided to the Project Officer for FAA Headquarters coordination and approval, as well as the final document.

Other pre-installation areas, such as facility preparation, training and provisioning not included above are covered in subsequent chapters.

c. Tasks Required for the CCD Site at the ACT (ACT-200 and ARD-140).

- (1) Developing data and techniques to simulate information which comes from the demarcation box, and weather and LCP data to be used for factory and ACT testing.
- (2) Developing an Engineering Evaluation Plan to include criteria and procedures for conducting the engineering tests. Defining test areas such as maximum loading, inducing errors and failures, fail safe and fail soft operations, human factors, system management, time to repair and reliability considerations should be addressed in the plan. Schedule information and resource requirements should also be included. A comprehensive outline of the plan content will be provided to the Project Officer for FAA Headquarters coordination with AAF-300 and approval, as well as the final document.

- (3) Developing an Operational Evaluation Plan in coordination with ASO. It should include criteria and procedures for conducting the evaluation. Differences between the two sites (Atlanta and ACT) in the conduct of the evaluation should be noted in the plan since one site conducts ATC operation functions and the other is experimental. Schedule and resource requirements for conducting the evaluation should be a part of the plan. A comprehensive outline for the plan content will be provided to the Project Officer for FAA Headquarters coordination and approval, as well as the final document.
 - d. TIDS Transition Plan. The TIDS program management will develop the transition plan as the TIDS planning and programming become more developed at the FAA Headquarters.
34. POST-INSTALLATION/ACCEPTANCE SUPPORT. The post-installation project support basically includes the engineering evaluation and operational evaluation of the CCD systems, and supporting contractor maintenance after system acceptance.
- a. Engineering Evaluations. The ACT-200, supported by ARD-140, at the FAA Technical Center will be tasked to perform engineering evaluations on the CCD system. This will include such tests as maximum loading, inducing errors and failures, fail safe and fail soft operations, human factors, system management, time to repair and reliability tests as indicated in the Engineering Evaluation Plan. Where required, enhancements, hardware/software redesign and/or reconfigurations will be identified as a result of the evaluation activities. The Project Officer coordinates the engineering efforts and arranges for technical support, as required. The results (report) of the tests are coordinated at FAA Headquarters by the Project Officer.
 - b. Operational Evaluation. The operational evaluation will be accomplished at both CCD sites: ACT-200 and ARD-140 at the FAA Technical Center, and ASO personnel, supported by ACT-200 and ARD-140, at the Atlanta CCD site. AAT-100 participates in the operational evaluations and reviews to insure that the system meets ATC operational requirements. The Project Officer will coordinate the evaluation efforts and arrange for assistance and observers (technical and operational) for the evaluations, as required. Results (report) of the testing are coordinated within FAA Headquarters by the Project Officer.
 - c. CCD Maintenance. Both sites develop a capability for assuming CCD maintenance from Electrodynamics, both hardware and software, at the end of the CCD contract period. Their personnel and training needs will be submitted through appropriate FAA channels in sufficient time to realize the capability. Maintenance support for the Tandem provided hardware and software is separate from the CCD contract.

d. Transition the CCD System at ACT to the TIDS Program.

It is expected that the TIDS program will be sufficiently defined so that the CCD project can be transitioned and integrated into this program at the end of the evaluation period. As indicated earlier, planning and transitioning guidance will be provided as the TIDS program evolves.

35. - 40. RESERVED.

CHAPTER 4. PERSONNEL AND TRAINING

41. PERSONNEL REQUIREMENTS. Each organization will identify the personnel resources required to support the CCD project as defined herein. The level of resources will be consistent with the scheduled activities and assigned responsibilities, including transitioning and CCD operations. Any personnel support needed at the factory will be provided through temporary duty (TDY). The CCD contract provides for on-site maintenance for a period not to exceed three years after final acceptance of the last delivered system. Engineering and on-call maintenance support will be acquired from Tandem for the hardware and software provided by them. Figure 1-1 shows the major hardware items to be purchased from Tandem under the CCD contract. Some system engineering support can be expected from the SRDS System Engineering Contractor, The MITRE Corporation.

42. TRAINING.

a. Training Provided by CCD Contractor. The CCD contractor provides on-site training to experienced FAA technicians to qualify them to perform limited emergency facility restoration in the event the CCD maintenance technician is not immediately available to correct a system fault. This training will be oriented toward qualifying the FAA personnel to isolate problems and replace printed circuit boards (PCB's) from the on-site spare parts inventory.

(1) Training Objectives. The following are the training objectives for CCD contractor-provided training.

- (a) Recognize common system malfunctions.
- (b) Isolate malfunctions to the PCB level.
- (c) Replace faulty PCBs.
- (d) Additional training recommended by the contractor. The contractor may recommend and provide training for achieving additional capabilities. This is expected to develop as the project evolves.

(2) Training Schedules. The CCD contractor will conduct two classes in hardware maintenance at the ACT. Classes will be conducted in accordance with the approved CCD Contractor-provided plan. The maintenance technicians from ASO will attend hardware maintenance training classes when conducted at ACT. Hardware maintenance on-the-job (OJT) training will be provided by the CCD contractor at the Atlanta site during system checkout and testing.

b. Software Training Requirements. Responsible organizations will recommend training required for the FAA technicians in both the operating system and other supporting software provided with the Tandem system, and in the applications software provided by

Electrodynamics. This training will be coordinated by the Project Officer with APT-300. The training is needed to acquire an understanding of the system operations and to identify system malfunctions caused from software faults or data problems. Generally, the following courses are available from the Tandem Company except for applications software training which will be provided by Electrodynamics. The prerequisites for the software training are that the FAA programmers have experience in the use of a high order language, and it is desirable that they have some experience in, or are familiar with, the use of a block structured language.

- (1) Concepts and Facilities (5 days). This course provides a language-independent foundation and background for further training in other courses offered by Tandem. It covers the basic hardware and software structure of a Tandem 16, describes the major software subsystems, and introduces concepts needed in other software courses.
 - (2) Tandem/Transition Applications Language (T/TAL) (5 days). The T/TAL is a medium-level language used by Tandem for programming their software packages. It may also be used for programming applications software. It uses many high-level, block-structured constructs, but allows object code optimization comparable to that achievable through assembler coding. The course is intended for system programmers, system analysts, system managers and applications programmers.
 - (3) Guardian Programming (10 days). This course is an introduction to the Tandem operating system and its programmatic interfaces. It is intended for students who will write application software in T/TAL or who will write T/TAL service routines for use by high order language programs. The training provides the student with an understanding and use of the callable operating system procedures.
 - (4) System Operations and Management (5 days). This course provides training in methods and procedures for generating the operating system, loading the operating system, and controlling the operating environment through the use of standard system utilities. It will provide instructions for memory dumps, processor reloads, data base recovery and other similar actions. The course also includes instruction in procedures for installing a new operating system release with the standard utility, Install, provided by Tandem.
- c. Applications Software Training Requirements (5 days). This course will be oriented toward applications programmers who will be responsible for maintaining the applications software. The persons completing this course will be able to diagnose applications software problems, and accomplish minor corrections for continuing

system operations where a malfunction occurs. The classes will be conducted at both sites by Electrodynamics.

- d. Operator Training (5 days). This course covers the basic hardware and software structure of Tandem equipment, describes the major software subsystems, and introduces concepts and procedures needed to operate the system. The course is intended for computer operators who are to operate the Tandem computer systems. Training by Electrodynamics will basically be accomplished through on-the-job training methods at each site. The course prerequisites are that the student be familiar with standard data processing equipment and terminology.
 - e. Air Traffic Control Specialist/ Supervisor Training (5 days). This training will provide the air traffic control specialists and controller supervisors with the knowledge and skills for operating and making use of the system. The training, consisting of both classroom and hands-on, will be conducted by Electrodynamics at the two sites. The students to attend this training will be the ATCT and TRACON air traffic control specialists and supervisory personnel of the ASO. Personnel at the FAA Technical Center will be those who will conduct engineering and operational evaluations of the system.
43. TRAINING IMPLEMENTATION. The training described under "a" above for hardware maintenance will be provided by the CCD contractor, Electrodynamics. Arrangements will be made with the CCD contractor to provide applications software, operator and air traffic control specialist/supervisor training. All training provided by the CCD contractor will be conducted at the sites, i.e., ACT and Region. Other training described above (Concepts and Facilities, T/TAL, Guardian Programming, and System Operations and Management) will be given by Tandem at one of their training facilities. The training by Tandem will be coordinated by the Project Officer with ACT, ASO and APT-300. APT-300 will provide funding, required contract negotiations, and scheduling of training related activities. The location for this training will be determined at a later date and identified in the CCD training plan.
44. DELIVERY OF TRAINING MATERIAL. The training materials developed by Electrodynamics for conducting training become a contract deliverable. It is expected that reproducible copies will be provided to each CCD site for use in follow-on training. Materials may include handbooks, slides, photographs, vu-graphs, and voice recordings.
45. - 50. RESERVED.

CHAPTER 5. LOGISTICS AND MAINTENANCE SUPPORT

51. POLICY AND RESPONSIBILITY. This chapter provides the broad policy and planning considerations for the logistical, including maintenance, support of the CCD systems during development at the contractor facility, delivery, site testing at ACT and the Atlanta site, and support following system acceptance.
- a. Applicable FAA Publications. The FAA guidance publications to be used for logistical support of the CCD systems are identified in the CCD contract.
 - b. Logistical Support Responsibilities. The CCD contractor provides all spare parts and other logistical support during factory production and testing, and during system acceptance testing. Following system acceptance of the last system, spare parts are provided according to provisioning arrangements and agreements between the contractor and the Government. Provisioning will be accomplished for only the equipment fabricated by Electrodynamics, e.g., display and facility processing units. Support for equipment from Tandem will be provided by the Tandem field maintenance organizations. The contractor provides all technical documentation for spare parts provisioning and management.
 - c. Maintenance Support. The CCD contractor provides maintenance support commencing after installation and acceptance of the systems for a period not to exceed three years. This includes maintenance on only the software and hardware developed and fabricated by Electrodynamics under the CCD contract. Maintenance support for the Tandem-furnished software and hardware will be provided through separate arrangements with Tandem.
52. PROVISIONING. The AAC-400 is responsible for the final provisioning of spare parts. Provisioning is accomplished by a review of recommended lists of spare parts from the CCD contractor, and AAC-400 may require a conference(s) before final provisioning decisions are made. Spare parts peculiar are identified in accordance with the CCD contract and Specification FAA-G-1375a. The spare parts common will also be identified. The level of spare parts to be stocked at the FAA depot and at the sites will be determined through the provisioning process. Funding has been established in the contract for spare parts procurement. Spare parts common may be provided from current depot stocks. The FAA depot will support the sites for replenishment actions. The provisioning activities are coordinated with the Project Officer, and are accomplished in accordance with the terms of the CCD contract.
- a. Site Spare Parts. The site spares consist of one each printed circuit board and/or replacement modules for the item of equipment provided as part of the CCD system. The site spares are shipped to the two sites at the time of shipment of each system. The CCD contractor is responsible for, and may use site spares during

equipment installation and through acceptance testing (spares used will be replenished by the contractor). Following system acceptance, the ASO and ACT-200 insure the receipt of spare parts in accordance with quantities determined during the provisioning process. Both sites provide for adequate storage space and afford the protection to spares inventories in accordance with appropriate FAA directives. Each site will establish accounting records to conform with FAA standards and requirements. The normal FAA procedures are used for budgeting and replenishment of site spares.

- b. Depot Spare Parts. Spares, if any, to be held as FAA depot inventories to support the CCD sites will be determined through the provisioning activities. The CCD sites submit requisitions for depot spares support through normal resupply procedures. The normal FAA procedures are used for budgeting and replenishment of depot spares.

53. TOOLS AND TEST EQUIPMENT.

- a. Special. The CCD ER emphasizes the use of off-the-shelf processing equipment and components. Consequently, the need for special tools and test equipment is not anticipated. If special tools and test equipment are identified during CCD development, their utilization must be approved by the CCD Project Officer. The AAC-400 is responsible for provisioning approved special tools and test equipment. The contractor provides the instruction manuals or booklets for the use of the equipment. Any special tools and test equipment become the property of the Government.
- b. Standard. The CCD contractor provides a list of the standard test equipment required for the CCD system maintenance. The contractor also provides the functional and performance characteristics of this equipment. The AAC-400 provides project support for the review and validation of the requirements and determines the need for procurement actions where such equipment is not in depot or site inventories.

54. EQUIPMENT AND SOFTWARE MAINTENANCE. The CCD contract maintenance for the CCD system starts after final acceptance of the last system. The system includes both software and equipment as defined in the CCD contract. Prior to acceptance, maintenance is accomplished at the contractor's expense. A technical representative (TR) is appointed at each CCD site to represent the Contracting Officer for monitoring and managing the contract maintenance activities. These activities are covered within the scope of the written delegation of authority issued by the Contracting Officer. The type of contract maintenance support include periodic (preventive) and corrective maintenance. The periodic maintenance is performed to retain an item in satisfactory operational condition by detection and prevention of incipient failure by means of systematic inspection. Corrective maintenance is performed to restore an item to a satisfactory condition where degradation of the item occurred between the preventive maintenance periods. The periodic

maintenance is scheduled and corrective maintenance is accomplished on an on-call basis. The maintenance support resources identified in the CCD contract include:

- a. Engineer/Technician 160 man-days
- b. System Analyst 100 man-days

Each CCD site provides for the contractor interfaces, e.g., telephone numbers, names of FAA personnel for coordinating and managing the maintenance activities, and site passes for contractor personnel. The type and level of maintenance support from Tandem will be accomplished through special arrangements as scheduled in Appendix 1.

55. MAINTENANCE PROCEDURES.

- a. Responsibilities. After system acceptance, the Government has a responsibility for maintaining at each site the spare parts and equipment needed for correcting faults. The contractor is responsible for maintaining the system at a performance level specified in the contract.
- b. Maintenance Performed by the Government. The Government maintenance personnel are to be sufficiently trained to diagnose problems and accomplish part replacement at the printed circuit board (PCB) level. If the replacement of the faulty PCB does not restore the system to full operational capability, the system will remain in a reduced capability state until the contractor engineer responds. It is not expected that Government personnel will replace PCB's on the Tandem-provided equipment.
- c. Preventive Maintenance. The schedule for performing preventive maintenance by the CCD contractor and Tandem will be coordinated by the TR at each site. The preventive maintenance includes the use of diagnostics, inspections, testing, cleaning, making adjustments/alignments, and making repairs as required.
- d. Corrective Maintenance. The CCD contractor and Tandem service shall commence promptly, after notification that hardware/software is inoperative or that degradation of a function has occurred and/or when through the process of performing preventive maintenance, it is determined that failure is imminent. Government maintenance personnel provide the on-call engineer with information concerning the nature of the fault, both equipment and software. Operator and maintenance logs are maintained by the Government for aiding the maintenance process. Software trouble reports similar to those issued for NAS systems, or an approved contractor-provided reporting form, are accomplished by Government personnel for solving software problems by the contractor engineer. The CCD contractor response time is a guaranteed maximum of 24 hours for performing corrective maintenance. Response time for Tandem maintenance support will be developed for each CCD site.

- e. System Maintainability Data Collection. The guidance for the maintenance data collection activities are included in the following FAA Handbooks:

<u>Handbook Number</u>	<u>Title</u>
6030.36B	Preparation of FAA Form 6030.1, Facility Maintenance Log
6040.5	Facility Outage and Equipment Failure Report
6040.10	Equipment Failure Handbook

- (1) Performance Data. The CCD contractor is required to record performance data on both hardware and software regardless of failure "on-line" or "off-line". The FAA Form 6040-3, or an approved equivalent, is to be used. The Government equipment/software maintenance personnel also maintains performance data for their level of maintenance activity.
- (2) Manpower Utilization. The CCD contractor, as well as the Government, will record manpower utilization data on Forms 6040-1 and 2, and 6030-1, or their equivalents approved by the Government. These forms provide for entries on manpower expenditures by work functions performed (preventive or corrective), narrative description of problems discovered, and corrective action and certification of hardware/software performance.
- (3) Spare Parts Usage. The CCD contractor, as well as the Government, records the usage of spare parts. The contractor reports usage on a monthly basis to the TR. The TR may require more frequent reporting (weekly) if required by extensive parts usage. The usage data is used for replenishment by the Government.
- (4) FAA Maintenance Scheduling. The CCD contract provides options for the Contracting Officer to change maintenance schedules as follows:
 - (a) Routine Shift Service Coverage. Seven day notice.
 - (b) Contractor Personnel. Increase or decrease in contractor personnel, including complete termination of service: thirty day notice.
 - (c) Equipment. Deletion or addition of equipment elements: thirty day notice.

56. SOFTWARE MAINTENANCE. The training defined in Chapter 4, Personnel and Training, will provide Government personnel with the capability to recognize software problems and, in some cases, to correct minor

software errors. The software developed and written by Electrodynamics is to be maintained by the CCD contractor for no more than a three year period. The Government personnel should be sufficiently knowledgeable in the Tandem standard software for accomplishing system generation, installing new operating system versions that may be offered by Tandem, recognizing software problems and use of the software tools for program maintenance. They should also have the capability of making value judgements for the acceptance or rejection of new operating system versions and other software changes as offered by Tandem.

57. - 60. RESERVED.

CHAPTER 6. FACILITY PREPARATION

61. FACILITIES . The CCD central computer system and communications interfacing equipment will be located in the TRACON equipment room at the FAA Technical Center and the equipment room of the Tower Cab at the Region. Any simulation, special interfacing, or like equipment will also be located in the equipment room. Both sites will provide areas for maintenance, spare parts, tools and test equipment for supporting contractor maintenance. Both organizations provide the CCD contractor with information on the existing physical resources. The CCD contractor than provides an installation plan for both sites. These actions are scheduled in Appendix 1.
62. FACILITY REPORT INSTALLATION AND CUTOVER PLAN. Each organization, ACT/ARD-140 and Region, provides the CCD contractor through the Project Officer with an Installation and Cutover Plan (identified as Facility Report in the CCD contract) to include information about the physical resources available for installation and operation of the CCD system. The report will include at least the following information.
 - a. Proposed Location of the Equipment. This will identify the proposed location for the computer processors and the peripheral equipment (disc and tape units, printers, controllers, SMD, FPU, and Modems). It will identify the location for maintenance and logistics support and for the storage of magnetic tapes and other portable storage media. If a temporary area is to be used for system testing prior to installation of the Tower Cab and TRACON displays, it will be identified. The designated operational location for the displays for the Tower Cab and TRACON rooms will also be identified in the report.
 - b. Floor Plan Layout. This will show the planned location of the CCD equipment, tape storage and maintenance areas in the equipment room, and the positioning of the displays in the Tower Cab and TRACON rooms. It will also show the location of existing equipment, especially the GFE that interfaces with the CCD system.
 - c. Cable Routing. A layout for cable routing will be shown, to include cable lengths required for both signal and power cables. Emphasis will be on cabling between the equipment room and the Tower Cab and TRACON displays; and interfacing cabling between the CCD and GFE. The report should also provide a description of any existing raceways, conduits, ladders, etc. for cabling.
 - d. Location and Availability of Power. The report will include the kilowatts (KW) of power available, voltage, amperage, frequency and its source, and an indication of its reliability, e.g., a listing of other major users on the same power source that may cause power fluctuations. The Government will provide power to a main power panel, with the required circuit breakers. The power to the Tower Cab and TRACON displays will be provided from a central source provided by the contractor.

- e. Available Air Conditioning. Show the available air conditioning in tons, cubic feet of air flow per minute, and temperature and humidity range controls for each location where the CCD equipment will be located.
 - f. Floor Loading and Ceiling Heights. Describe the type of flooring in the equipment room, e.g., raised flooring, its loading capacity, and the available space between the flooring and the ceiling.
 - g. Equipment Grounding. Include the availability of an equipment grounding system and its characteristics.
 - h. Access for Equipment Delivery. Show routing for delivery trucks and any restrictions to the movement of equipment, and indicate Government provided transport equipment and its availability for unloading and movement.
 - i. Packing Materials. Indicate whether the Government disposes of packing crates and materials, or if the contractor removes this material.
 - j. Contractor Support. Provide information concerning maintenance area support, such as electrical outlets, lighting, ventilation, storage, furniture, telephones, supplies, etc.
 - k. Building Location. Provide the contractor with exact addresses and locations for equipment delivery.
 - l. FAA Focal Point. Provide name, title, telephone number, address, etc. of the on-site FAA focal point for interfacing with the contractor concerning facility preparation and installation activities.
 - m. Airport Management/Operations. Show interfacing and coordination required with the local airport authority/operations for facility preparation support.
63. CONTRACTOR INSTALLATION PLAN. The contractor provides an installation plan according to the schedule in Appendix 1. Each facility permits the contractor to conduct a site survey for the preparation of the plan. The plan will include, as a minimum, the following topic areas.
- a. System block diagram with a short, narrative, general description of the functional capabilities and hardware subsystem.
 - b. Floor plan layouts for the equipment room. Information on equipment placement limitations, e.g., maximum distances between equipment comprising the system, and proposed equipment location.
 - c. Detailed physical description of the equipment including physical size, weight, clearance factors, ventilation requirements, cable entry, exit features, etc.

- d. Cable and duct requirements, to include such items as information on cable interconnection requirements, cable connections to power and signal junction boxes, quantity of cables to be used, etc.
- e. Power requirements to include information on size and type of power cabling to be used, type and size of required Government-furnished power panels, circuit breakers, electrical outlets, etc.
- f. Equipment grounding requirements will be stated.
- g. Any other technical or general information that will be required to properly prepare a site for installation, e.g., air conditioning requirements.

The contractor will update the installation plan to represent the "as built" record after completing the equipment installation as required by the terms of the contract.

64. FACILITY PREPARATION. The Government is responsible for the facility preparation to meet the installation and environmental requirements of the CCD equipment. The contractor provides all cabling (power and signal) between the CCD equipment modules, and between the CCD equipment and Government-furnished power panels, power outlets, signal junction boxes, and interfacing cabling to GFE. Following receipt of the Contractor Installation Plan, each facility will resolve any problem areas identified and then prepare a Facility Preparation Plan. The plan will show how the facility will meet the needs of the CCD equipment, to include, but not limited to, the following.

- a. Equipment Layout. Validate contractor's equipment layout plan, and include layout for location of display equipment in the Tower Cab and TRACON rooms. Include requirements and responsibilities for any special work, e.g., cutouts and work area modifications, and for installation of Tower Cab and TRACON displays.
- b. Power. Show how the power requirements will be met in the equipment room, maintenance, and other areas.
- c. Air Conditioning and Ventilation. Show how this requirement will be met to include cooling, humidity control, air handling, duct work, etc.
- d. Floor Loading. Each area will be shown separately, i.e., raised flooring and loading in the equipment room, and floor loading in the Tower Cab and TRACON rooms. Also include responsibility for floor cutouts and other preparations required for equipment installation.
- e. Cabling. Define the work required for cable raceways, ladders, conduits, etc. and identify responsibilities between the Government and contractor.

- f. Lighting. Show how the lighting requirements will be met for equipment operations and maintenance.
 - g. Equipment Maintenance. Include the preparation needed for the maintenance, spare parts, tools and test equipment storage areas, and include power, floor loading, ventilation and lighting for these areas.
 - h. Tape/Disc Storage. Describe work needed to prepare an area where tapes/discs will be stored, and include methods for protection against theft, fire, and other outside forces.
 - i. Equipment Grounding. Identify the Government's responsibility for equipment grounding, and show how the requirement will be met.
 - j. Implementation. List the actions required and/or completed to modify existing facilities through FAA in-house efforts or outside procurements. Include a schedule of the required actions and the organizations responsible for the on-time implementation. Also show safeguards for the Atlanta ATCT/TRACON to avoid losing existing FAA equipment certification during CCD installation, interfacing and testing.
65. CONTRACTOR SITE SURVEY. The Facility Preparation Plan is provided to the Project Officer for coordination and approval. The facility preparation is accomplished to meet schedules shown in Appendix 1. Prior to delivery of the CCD equipment, the contractor will make a site survey to insure that the facility preparation meets CCD installation and operating requirements.

66-70 RESERVED.

CHAPTER 7. ACCEPTANCE TESTING AND EVALUATION

71. GENERAL REQUIREMENTS. The engineering requirements document, FAA-ER-500-007, specifies the testing required for the CCD system acceptance. The FAA Technical Center system will be the first to undergo acceptance testing. In order to accomplish early evaluations of the CCD, there will be overlapping testing activities between the ACT and the ASO systems. The testing requirements are discussed under two general categories: Factory Testing and Site Testing. The testing schedules are shown in Appendix 1.
72. FACTORY TESTING. Although the CCD contractor is contractually responsible for all factory testing, including acceptance testing, the FAA nevertheless has certain responsibilities and activities to accomplish as follows:
- a. Test Team. The Project Officer appoints a test team from the appropriate organizations listed in Chapter 2 for witnessing the factory acceptance testing. Arrangements may be made to organize a joint FAA/Contractor team. The roles and responsibilities of the test team(s) will be identified in the contractor-provided test plans and procedures. The Project Officer accepts the systems for shipment to the sites, and prepares an acceptance report for the Contracting Officer.
 - b. Data Recordings. ARD-140 and ACT-200 will investigate the possibility of taking data recordings at the Atlanta ATCT/TRACON for use by the contractor for system development and for testing. This will be done in coordination with the ASO and the Project Officer. The recorded information should be used as inputs into the FPU's of the factory CCD systems.
 - c. Adaptation Data. ARD-140 and ACT-200 will insure that the adaptation data the contractor is using is current. This includes adaptation data for the Atlanta ATCT/TRACON as well as that for the ACT facility.
 - d. Review of Test Plans and Procedures. AAT-100, AAF-300, ASO, ARD-140 and ACT-200 will support the Project Officer in review of test plans and procedures.
 - e. CCD Documentation. The Project Officer, assisted by ARD-140 and ACT-200, will insure that the system documentation is current before the start of factory acceptance testing.
 - f. Contractor Testing. The CCD contractor should successfully complete all tests prior to the formal acceptance testing conducted for the FAA.

73. SITE TESTING. This testing consists of Acceptance Testing, Engineering Evaluation, and Operational Evaluation. This scheme is shown as Figure 7-1, CCD Testing and Evaluation. The office symbols shown inside the blocks of Figure 7-1 indicate the organizations having primary responsibility. Those organizations shown outside the blocks serve a supporting role. Each of the activities are discussed in the following subparagraphs.

- a. Acceptance Testing. The contractor is primarily responsible for site acceptance testing at both sites, with support from ARD-140, ACT-200 and ASO. An ASO representative(s) will witness the testing at the ACT to gain insight and make preparation for system acceptance activities at the Atlanta site. ARD-140 and ACT-200, as well as the ASO, support the acceptance testing activities at the Atlanta site. The contractor first verifies that the system operates at the ACT and Atlanta ATCT/TRACON environments as it did for factory acceptance before site acceptance testing starts. The following support by the Government will be planned for acceptance testing at both sites.
 - (1) Test Environments. ACT and ASO personnel will work with the CCD contractor in locating and installing the CCD equipment, and for interfacing the CCD with GFE for data inputs and outputs for the acceptance testing activities.
 - (2) Test Plans and Procedures. The contractor test plans and procedures should be updated from factory acceptance testing, and adapted to the requirements of each site. These are reviewed by ARD-140, ACT-200 and ASO personnel.
 - (3) Validation of Data Base. ACT and ASO personnel will insure the data base, e.g., adaptation data, is correct for the particular site.
 - (4) Test Teams. The test team structure should be similar to the one used for factory acceptance testing. However, other Government personnel such as computer operators, and maintenance technicians will participate at each site where they were not required for factory testing.
 - (5) Operational Demonstration. The contractor demonstrates that the system is capable of meeting the operational requirements for use by the air traffic control specialists. ARD-140 and ACT-200 may develop scenarios and scripts for testing the operational capabilities of the system. These are needed where the contractor is not required by the contract for their development. Operational demonstrations are especially important at the ASO site where actual operational input data can be used and where the ATC functions are accomplished in the ATCT and TRACON.

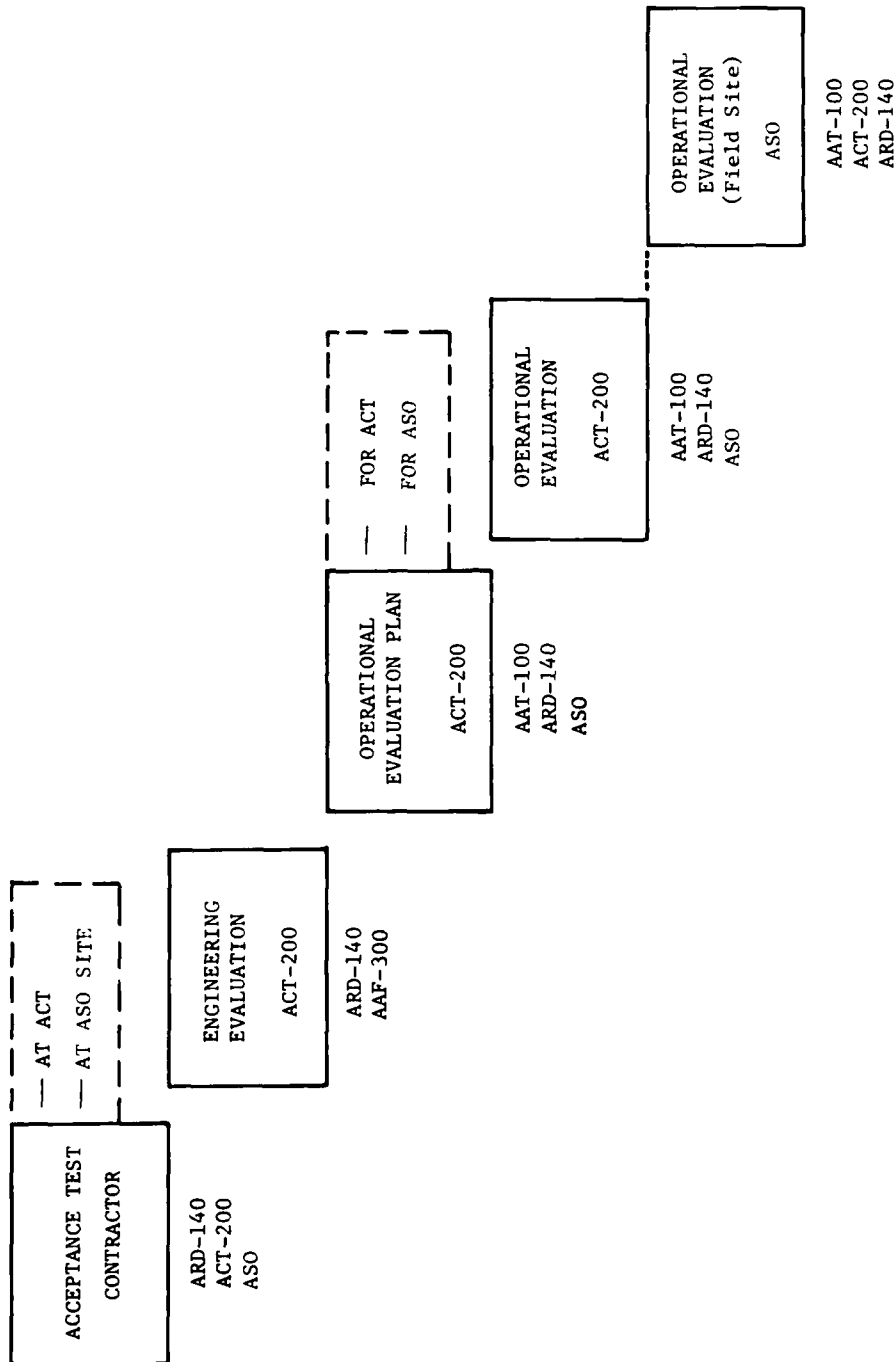


FIGURE 7-1
TESTING AND EVALUATION STAGES

- (6) System Acceptance. The Project Officer accepts the systems at the sites, and prepares an acceptance report for the Contracting Officer.
- b. Engineering Evaluation. The ACT-200, supported by AAF-300 and ARD-140, is responsible for making engineering evaluations of the CCD system at the ACT site only. The engineering evaluations occur after acceptance testing at the factory and the ACT site. The ACT-200 and ARD-140 will develop an engineering evaluation plan for coordination and approval by the Project Officer. The plan will identify the areas for evaluation such as reliability, maintainability, expandability, ability to handle errors, data recovery, display characteristics (brightness, contrast, jitter, controls, etc.), system capacity limits (including response times), fail safe/fail soft characteristics, processing and data display accuracy, ease of system entry and the need, if any, for system improvements. A written report, with recommendations, covering the results of the evaluations are provided by ACT-200 and ARD-140 to the Project Officer for review, coordination and appropriate action.
- c. Operational Evaluation. This evaluation is accomplished at both sites. The ACT-200 has primary responsibility for the activity at the FAA Technical Center, with support from AAT-100, ARD-140 and the ASO. The operational evaluation at the Atlanta ATCT/TRACON is accomplished by ASO with support from AAT-100, ARD-140 and ACT-200 personnel.
- (1) Operational Evaluation Plan. The ACT-200, supported by ARD-140 and ASO, is responsible for developing the Operational Evaluation Plan. The Project Officer coordinates the plan for approval. The plan will address the ways and means for transitioning from the current system to the CCD at the Atlanta ATCT/TRACON for the operational evaluation. The plan will identify resource requirements, responsibilities and include schedules. The planning and evaluation will include typical items such as those listed below; the list is not intended to be all inclusive.
- (a) Management and control procedures between the ATCT and TRACON for such things as data base management and updating, reporting and correcting system faults, restrictions for system entry, etc.
 - (b) ATCT and TRACON controller specialists acceptance of and confidence in the system.
 - (c) Ease of system usage by the air traffic control specialists, and improvements in controller performance. Items to consider include:

- 1 Difficulty/ease to log-on and log-off, and time for making data entries.
 - 2 Transfer of responsibilities during change of work shifts.
 - 3 Ease of reading and interpreting data displayed, e.g., sampling rate for wind speeds and wind gusts, and presentation formats.
 - 4 Display brightness, contrast, jitter, linearity, focus, size and location, including evaluation for both day and night operations.
 - 5 Ease in using function keys and other controls.
 - 6 System response to ATC specialists' needs.
 - 7 Improvements in coordination/communications for air traffic control.
 - 8 Transitioning to back-up capabilities during partial system failure.
 - 9 Transitioning to manual systems during total system failure.
 - 10 Start-up/restart times and procedures.
 - 11 Combining and decombining for peak/low activity.
- (d) Verification of the accuracy of displayed information and processing.
 - (e) System reliability under operating conditions, i.e., mean time between failures.
 - (f) Difficulty/ease in identifying and tracing problems.
 - (g) Responsiveness of maintenance contractor for correcting equipment malfunctions and software faults.
 - (h) Evaluation of training programs for controller specialists, hardware and software maintenance technicians, and computer operators.
 - (i) Proficiency of personnel in the operation and maintenance of the system.
 - (j) System flexibility for making changes and improvements.

- (k) Evaluation of environmental limits, e.g., power and air conditioning upper and lower limits during operational usage.

(2) Conducting the Operational Evaluation.

- (a) ACT System. The system at the FAA Technical Center will first undergo the operational evaluation, followed by the evaluation of the system at the ASO site. ACT-200 has primary responsibility for conducting the evaluation at the ACT, with direct support from ARD-140. An observer(s) from ASO participates in the evaluation at the FAA Technical Center to gain experience for conducting the evaluation at the Atlanta site. The AAT-100 participates in the evaluation and makes reviews to insure that the system meets ATC operational requirements. The results of the evaluation (report), with recommendations, will be provided to the Project Officer for coordination and appropriate action. Organizations conducting the evaluation develop the report.
- (b) ASO System. The operational evaluation starts at the Atlanta site after the evaluation is completed at ACT. The evaluation plan for the ASO is updated, as required, from the experience gained at FAA Technical Center. The ASO has primary responsibility for conducting the evaluation, with support from ARD-140 and ACT-200. Participation by AAT-100 for the ASO system is paramount for the evaluation to determine whether it meets ATC operational requirements and is suitable for subsequent use at the Atlanta ATCT/TRACON and other sites. The evaluation results (report), with recommendations, are provided to the Project Officer for coordination and appropriate action. Organizations conducting the evaluation develop the report.

74. - 80. RESERVED

CHAPTER 8. POST-CCD EVALUATION

81. ENGINEERING/OPERATIONAL EVALUATIONS.

- a. Objectives. The objectives of the engineering and operational evaluations is to determine design acceptability and the utility of the CCD system by the ATC specialists in performing their ATC functions.
- b. Reporting Evaluation Results. The engineering evaluation (conducted at ACT) and the operational evaluations (conducted at both ACT and the ASO sites) will be oriented to insure the CCD meets the objectives. The organizations conducting the evaluations, i.e., AAT-100, ARD-140, ACT-200 and ASO, develop written reports showing the results of the evaluations and making specific recommendations concerning a further course of action(s) for the CCD project. The reports are reviewed by AAT and SRDS to determine further actions. The emphasis on the operational evaluation aspects by AAT-100 and the ASO will be paramount in the determinations. AAT-100 has the principal responsibility for ASO coordination and arranging for organizational interfaces for completing all project activities at the Region site.

82. CCD PROJECT OPTIONS. Three options are discussed in the remainder of this chapter.

Option 1 - Project termination after operational evaluation.

Option 2 - Project expansion after operational evaluation.

Option 3 - The CCD remains at the ASO site with no follow-on systems.

- a. Option 1. This option assumes that the CCD design will not meet the operational requirements of ATCT/TRACON air traffic control, and that the equipment and software will not remain at the ASO site nor will like systems be planned for other operational sites. Under this option, the following actions should be planned.
 - (1) CCD System at ACT. The system may remain at ACT for supporting TIDS development and/or experimental work. This work will be covered by normal SRDS/ACT agreements. If the system is not needed at ACT, the hardware components (both standard and special) may be transferred to other FAA projects where they can be economically used. Unusable equipment, both standard and special, will be reported to the General Services Administration (GSA) on GSA Form 120 as excess property. It is then listed in the GSA excess property catalogue for 120 days as available to other Governmental agencies. If any property is not accepted by another agency, the GSA will dispose of it through sales, or the FAA may dismantle

equipment and use common items for spare parts. The GSA Regions handle local sales. Items of no value to the Government may be sold as scrap. The property not useable by FAA will be held at ACT for at least 120 days for final disposition. Sales by GSA Regions are made for the FAA site, i.e., the purchaser accepts the equipment from the FAA site.

- (2) CCD System at the ASO Site. The system may be transferred to ACT to meet FAA technical requirements for TIDS and/or other project work. If this does not occur, equipment components (both standard and special) may be transferred to other FAA projects where they can be economically used. Any unusable equipment will be reported to GSA on Form 120 and disposition, storage, etc. will be handled as described under item (1) above.

- b. Option 2. This assumes that the system remains at the ASO site for supporting ATC operations, and that additional CCD systems will be procured for other sites.

- (1) CCD System at ACT. The system will remain at ACT for field support and for the TIDS program.
- (2) Follow-on Systems for Terminal Sites. A determination will be made by AAT, with support from SRDS and AAF, the number and location of sites to receive a CCD system. This determination will be made prior to the beginning of the fiscal year (FY) which starts before final acceptance testing at ACT and the ASO site. This would be no later than FY-83. This planning is time critical so as to budget and fund in time to avoid complete restarting of contracting, system build and contractor activities. Typical actions are as follows:

- (a) SRDS, with support from ACT, develops the Technical Data Package for follow-on procurement.
- (b) AAT-100 and AAF-300 develop a transition and utilization plan and assume ownership and supporting responsibilities of the field systems.
- (c) AAT-100 and AAF-300 develop a program plan for implementation of the operational systems.
- (d) AAT-100 and AAF-300 develop budgetary and funding requirements.
- (e) ALG-300 provides contracting, in-plant and other support.

- c. Option 3. This assumes that the CCD system remains at the ASO site, with no follow-on like systems for other operational sites.

- (1) CCD System at ACT. The system will remain at ACT for support and the TIDS program.
 - (2) Transition and Utilization Plan. AAT-100 and AAF-300 develop a transition and utilization plan and assume ownership and supporting responsibilities for the Region site.
83. BUDGETARY AND FUNDING. The budgeting and funding requirements are discussed for each option detailed above.
- a. Option 1, Project Ends. This includes the relocating of equipment.
 - (1) Equipment Transferred to other FAA Projects. All costs associated with removal, packing and shipping (including spare parts, special tools and test equipment, etc.) are born by the project receiving the items.
 - (2) Equipment Transferred to Other Governmental Agencies. The costs associated with packing and shipping the equipment and supporting items is born by the receiving agency.
 - (3) Equipment Sold as Surplus by GSA. The equipment may be sold by the GSA Region from the FAA sites at no cost to FAA.
 - (4) Equipment Shipped to FAA Depot. All funds for disposition of this equipment will be provided by AAF.
 - (5) Restoration of CCD Facilities. The cost to restore the CCD facility at the ASO site will be funded by AAF; similar costs at the FAA Technical Center will be funded by ACT.
 - b. Option 2, Project Continues with Operational System at the ASO Site and Follow-on Systems
 - (1) Budget Years. Budgeting should be accomplished so that funds are available at the beginning of Fiscal Year 1983.
 - (2) Budgeting Responsibilities. AAT-100 and AAF-300 are responsible for budgeting actions. The budgeting should include funds for acquisition of equipment, logistical and maintenance support, personnel and training and facility preparations.
 - c. Option 3, Project Continues Only at the ASO Site. Budgeting will be accomplished by AAT-100 and AAF-300 for supporting the ASO site, starting in FY 1983. The CCD remaining at the FAA Technical Center will be supported by ACT.

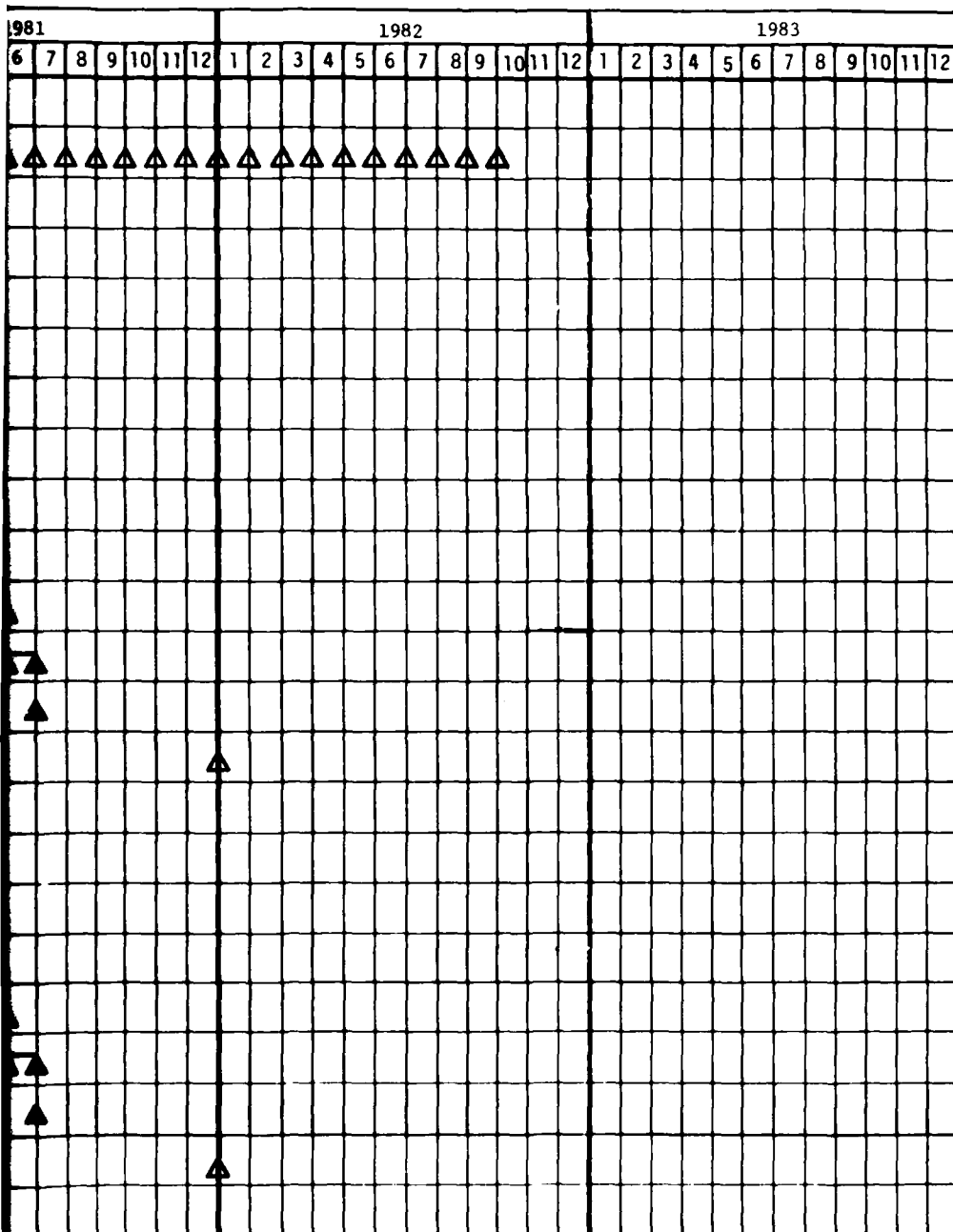
84. - 90. RESERVED

APPENDIX 1 SCHEDULES

This Appendix includes major milestone and schedule information for the two CCD systems. The schedule information is included from the start of the contract and carries through the operational evaluation events/activities. The information is shown on two enclosed figures: Figure 1, Detailed Schedule, and Figure 2, Summary Schedule. The beginning and ending periods shown on the figures are indicated by a triangle symbol. The open triangles indicate that the contractor is responsible for the events/activities, while the closed (solid) triangles indicate the Government is responsible.

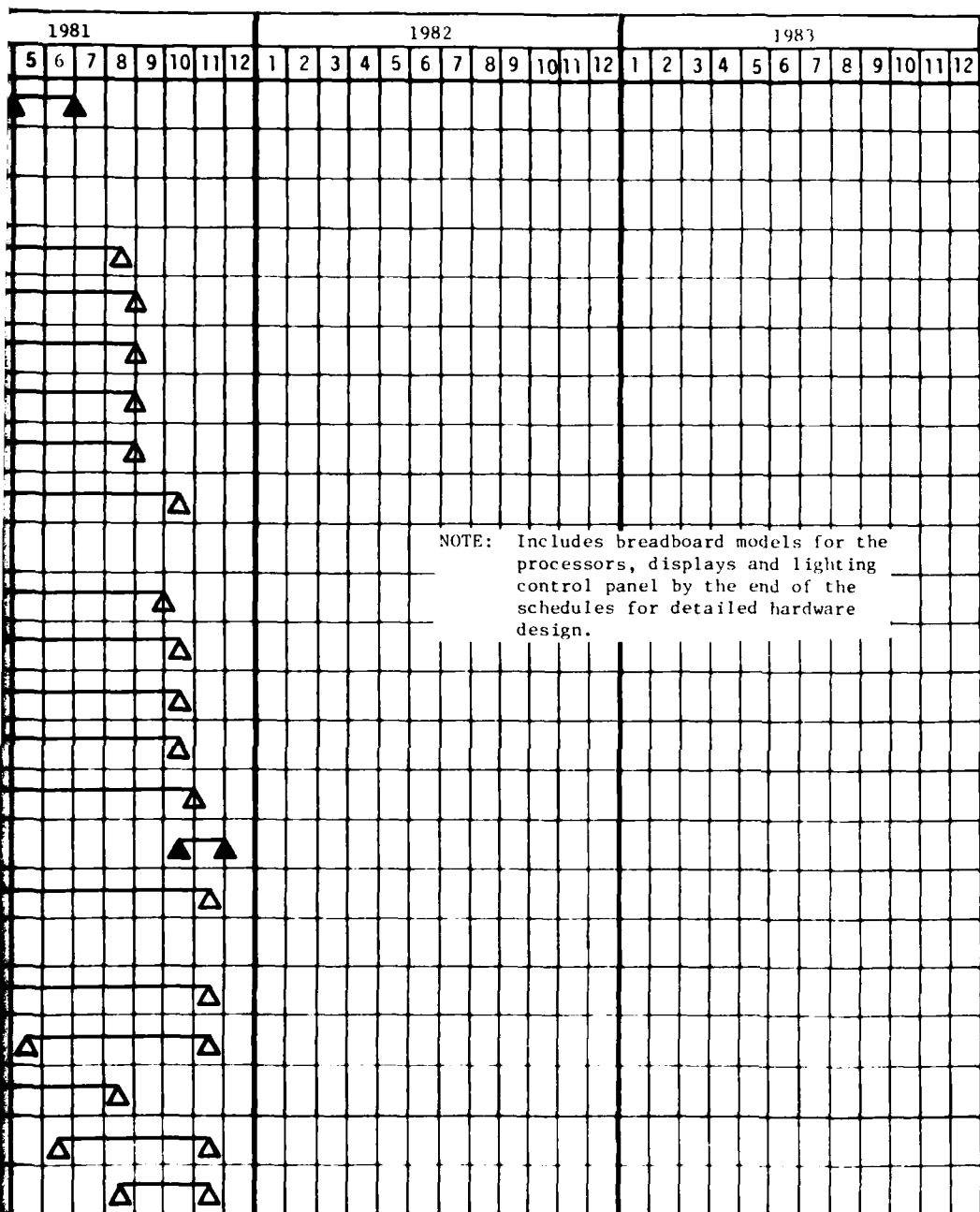
There are notes added for some events/activities to lend clarity. An example of this is for item 26 on Figure 1. The note indicates that the Tandem-provided equipment will be shipped to ACT directly from the Tandem factory. The display and other equipment assembled by Electrodynamics will be shipped to ACT from their factory at Chicago after factory acceptance. All equipment for the ASO site is shipped from the Electrodynamics facility at Chicago after factory testing and acceptance of the total system.

[illegible]



**FIGURE 1
DETAILED SCHEDULE**

EVENTS/ACTIVITIES	1980												1981												1	2	3
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
a. Approve Plan																	▲	▲									
8. Hardware Design (detail)																											
a. Electrical:																											
Display Processor												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Supplementary Display												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Critical Display												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
TRACON Display												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lighting Control Panel												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Facility Processor												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
b. Mechanical:																											
Supplementary Display												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Critical Display												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
TRACON Display												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Lighting Control Panel												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Facility Processor												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
9. Approve Detailed Hardware Design																											
10. Purchase Hardware Components and Subassemblies												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
11. Software Design (detail) and Computer Programming																											
a. Central Processing Subsystem												▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
b. Display Subsystem																	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
c. Tower Interface Subsystem																	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
d. Maintenance Diagnostics																		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
e. Baseline Test Programs																											



**FIGURE 1
DETAILED SCHEDULE
(CONTINUED)**

2

EVENTS/ACTIVITIES	1980												1981														
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
12. Software Documentation																											
a. Overall Computer Program Description (OCPD)																	▲										
b. Approve OCPD																	▲	▲									
c. Computer Program Functional Specifications (CPFS)																		▲									
d. Data Base Table Design Specification (DBTDS)																			▲								
e. Software Interface Control Document (SICD)																				▲							
f. Approve CPFS, DBTDS, and SICD																		▲	▲								
g. Program Design Specifications (PDS), draft																				▲							
h. Approve Draft PDS																			▲	▲							
i. Final PDS																				▲				▲			
j. Approve Final PDS																								▲	▲		
k. Software Design Data (SDD)																								▲			
l. Approve Final SDD																											
13. Installation and Cutover Plan (Facility Report)																											
a. FAA Technical Center (ACT)																			▲								
b. Region, Atlanta (ATL)																			▲								
14. Installation Plans																											
a. ACT and ATL Sites																			▲		▲						
b. Approve Site Plans																					▲	▲					
15. Prepare Facilities																											
a. ACT																								▲		▲	
b. ATL																								▲			
16. As-built Documentation for ACT and ATL Sites																											

EVENTS/ACTIVITIES	1980												1981															
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
17. Provisioning																												
a. Item Identification																						▲						
b. Provisioning Parts List																						▲						
c. Numerical Parts List																						▲						
d. Master Pattern and Plan View, draft																						▲						
e. Reproducible Drawings, draft																						▲						
f. Approve Provisioning and Documentation																						▲	▲					
g. Approve Master Pattern & Plan View																												
h. Final Reproducible Drawings																												
i. Approve Final Provisioning Documentation																												
18. Instruction Book																												
a. Draft																								▲				
b. Approve Draft																								▲	▲			
c. Final																												
d. Approve Final																												
19. Special Tools and Test Equipment Definition																								▲				
a. Approve																								▲	▲			
20. Assemble Units for ACT System																							▲	▲				
21. Reliability Program Plan																												
a. Preliminary																								▲				
b. Approve Preliminary																								▲	▲			
c. Final																												
d. Approve Final																									▲			

**FIGURE 1
DETAILED SCHEDULE
(CONTINUED)**

EVENTS/ACTIVITIES	1980												1981																
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
22. Test Plan																													
a. Preliminary																							Δ						
b. Review																						Δ	Δ						
c. Final																							Δ	Δ					
d. Approval																								Δ	Δ				
23. Organize Test Team																													
24. Factory Test ACT System																							Δ						
a. Unit Verification																													
b. Subsystem Verification																													
c. System Verification																													
d. Reliability Demonstration																													
e. Reliability Report																													
f. Factory Acceptance																													
25. Pull Cables at ACT																													
26. Install and Checkout Tandem Equipment at ACT																													
27. Ship Display and Other Equipment from Electrodynamics to ACT																													
28. Ship Site Spares, Tools, Test Equipment to ACT																													
29. Integrate and Test ACT System																													
30. Final ACT System Acceptance																													
31. Assemble Units for ATL Site																													
32. Factory Test ATL System																													
33. Factory Acceptance																													
34. Pull Cables at ATL																													

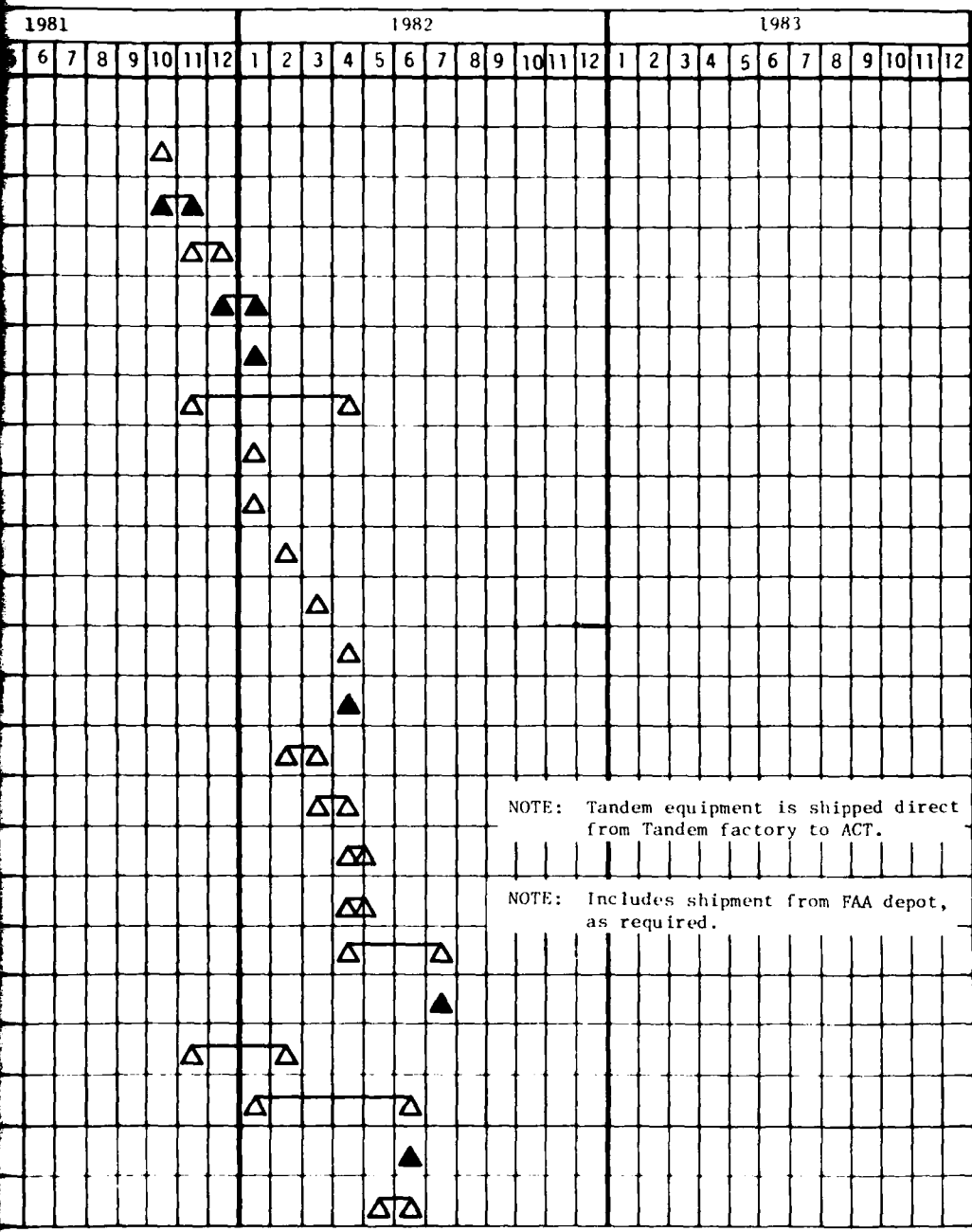
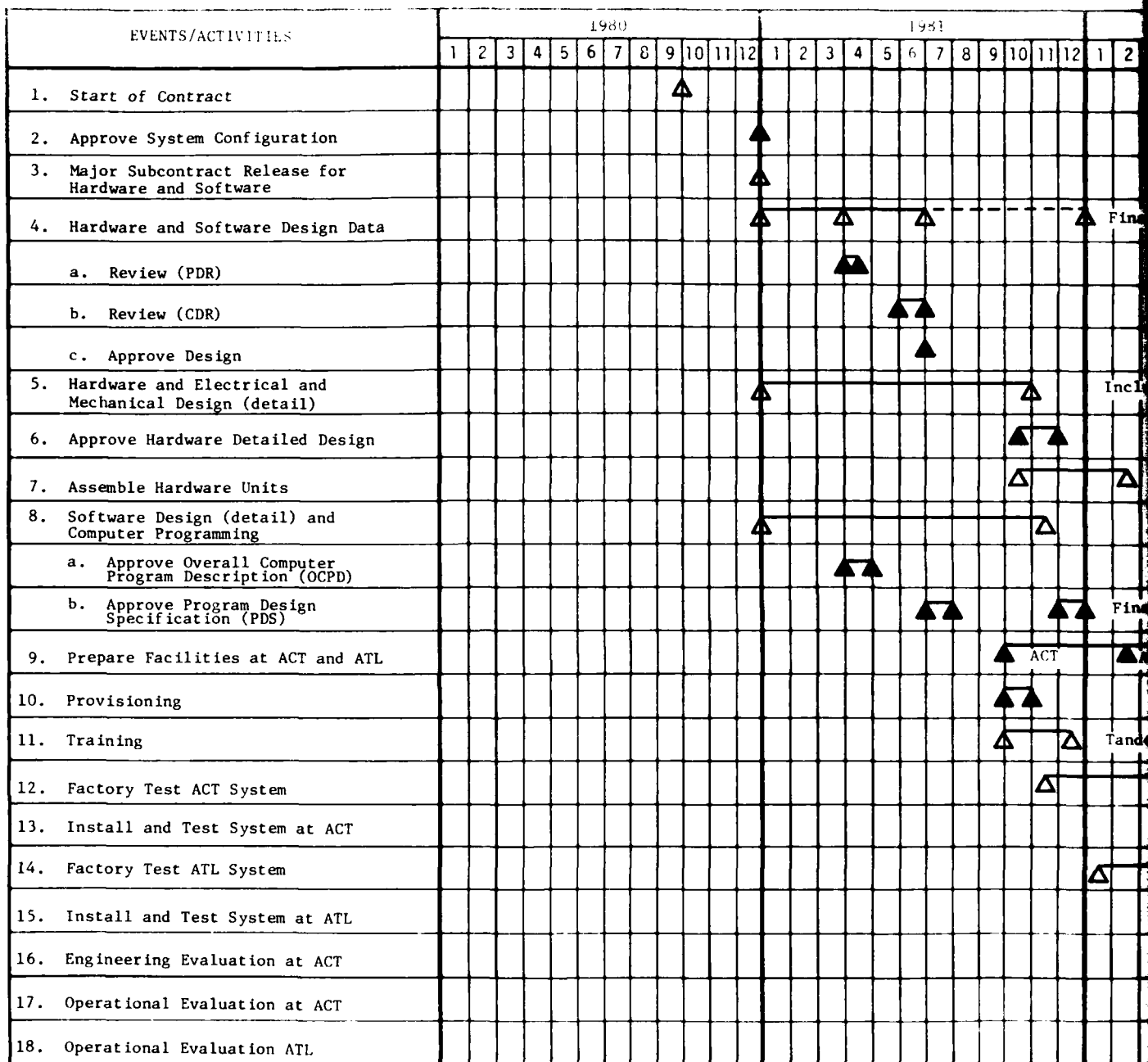


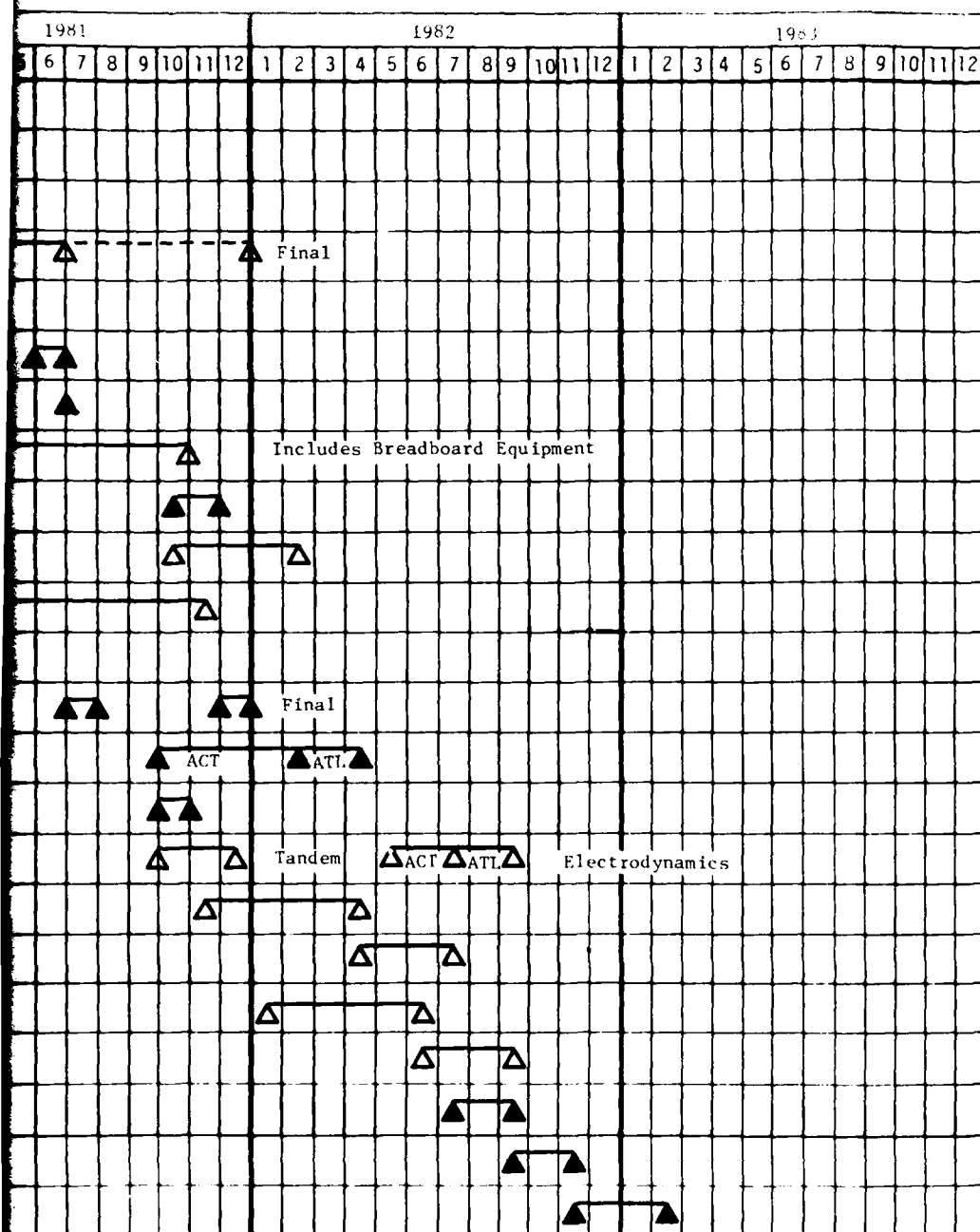
FIGURE 1
DETAILED SCHEDULE
(CONTINUED)

EVENTS/ACTIVITIES	1980												1981																
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
35. Ship System to ATL																													
36. Ship Site Spares, Tools, Test Equipment to ATL																													
37. Install and Test ATL System																													
38. Final ATL System Acceptance																													
39. Training by Tandem																													
a. Training Plan by FAA																													
b. Arrange for Tandem Training																													
c. Conduct Tandem Training:																													
ACT																													
ATL																													
40. Training by Electrodynamics																													
a. Training Plan																													
b. Approve Plan																													
c. Conduct Training at ACT:																													
Equipment Maintenance Classes for ACT and ATL																													
Application S.W. Classes																													
Operator OJT																													
User Classes/OJT																													
d. Conduct Training at ATL:																													
Equipment Maintenance OJT																													
Application S.W. Classes																													
Operator OJT																													
User Classes/OJT																													

EVENTS/ACTIVITIES	1980												1981																
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
41. Equipment/Software Maintenance																													
a. Arrange for Tandem Support																													
b. Tandem Maintenance Support																													
c. Electrodynamics Maintenance Support																													
42. Implement Configuration Management																													
a. ACT (TIDS)																													
b. ATL																													
43. Validate Documentation																													
a. Hardware:																													
Provisioning Parts List																													
Numerical Parts List																													
Master Pattern and Plan View																													
Reproducible Drawings																													
Instruction Book																													
Training Aids/Materials																													
b. Software:																													
OCPD																													
CPFS																													
SICD																													
PDS																													
DBTDS																													
SDD																													
Training Aids/Materials																													

[illegible]





**FIGURE 2
SUMMARY SCHEDULE**